2019 Multi-Hazard Mitigation Plan

Washington County

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1 Overview

1.1 Introduction

The Washington County Multi-Hazard Mitigation Plan (MHMP) serves as a guide for the county's assessment of hazards, vulnerabilities, and risks and actively incorporates the participation of a wide range of stakeholders and the public in the planning process. This plan aids the county, cities, and towns in preventing, protecting against, responding to, and recovering from disasters that may threaten the community's economic, social, and environmental well-being. This plan documents historical disasters, assesses probabilistic disasters through Hazus-MH and Geographic Information Systems (GIS) analyses, and addresses specific strategies to mitigate the potential impacts of these disasters.

The Washington County Emergency planning team and The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) originally developed the Washington County MHMP in 2013. The MHMP is not a static document but must be modified to reflect shifting conditions. This 2018 MHMP update represents a collaborative effort to ensure that the planning document accurately reflects changes within the community and addresses each jurisdiction's unique needs.

1.1.1 Disaster Mitigation Act of 2000

With the development of the federal Disaster Mitigation Act of 2000, FEMA requires counties to have an MHMP in order to be eligible for Hazard Mitigation Grant Program (HMGP) funds. All jurisdictions must have in place a multi-hazard mitigation plan and update the plan within a five-year time span. This plan update addresses changes in development, progress in local mitigation efforts, and alterations in priorities. This plan update will remain effective for 5 years from the date of community adoption.

The procedures outlined in the plan are based upon guidance provided by FEMA and are consistent with the requirements and procedures defined in the Disaster Mitigation Act of 2000. The analysis includes three components: 1) profile and analysis of hazard events, 2) inventory of vulnerability assessment of community assets, and 3) development of hazard mitigation strategies.

1.2 Hazard Mitigation

Hazards are events that are potentially dangerous or harmful and are often the root causes of unwanted outcomes. Both natural and human-caused hazards threaten loss of life and property in the county and are included in the plan. As Figure 1 shows, hazard mitigation is a part of the disaster management cycle and is defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

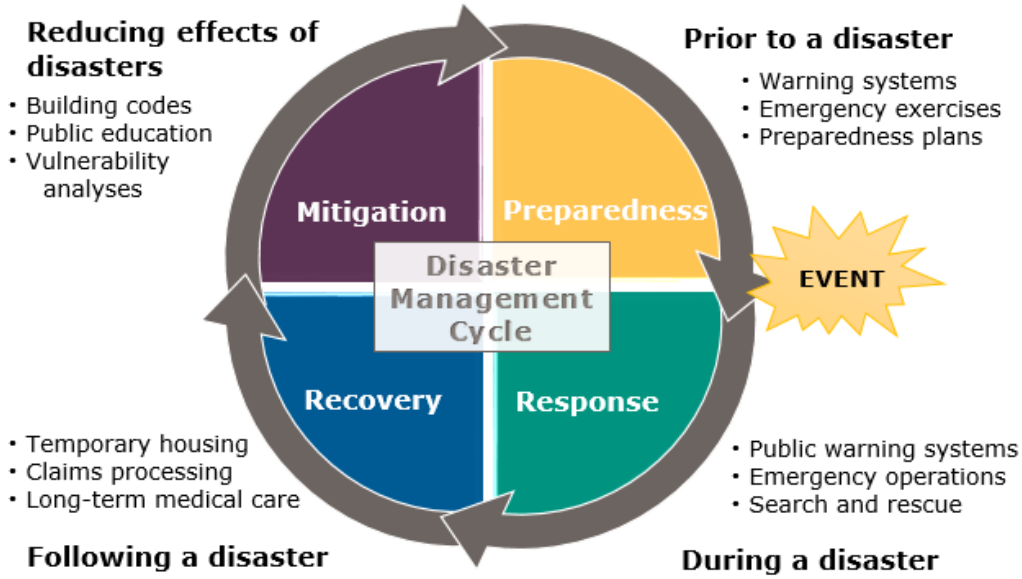

Figure 1. An Integrated Planning Process

Hazard mitigation planning and the subsequent implementation of the projects, measures, and policies developed as part of this plan are the primary mechanisms in achieving FEMA's goal of reducing hazards. Local governments have the responsibility to protect the health, safety, and welfare of their citizens. This plan recognizes the importance of mitigation for the following goals:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development.
- Prevent damage to a community's unique economic, cultural, and environmental assets.
- Minimize operational downtime and accelerate recovery of government and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.
- Help accomplish other community objectives, such as leveraging capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Developing and putting into place long-term strategies that reduce or alleviate loss of life, injuries, and property resulting from natural or human-caused hazards accomplish these goals. These long-term strategies must incorporate a range of community resources including planning, policies, programs, and other activities that can make a community more resistant to disaster.

2 Public Planning Process

2.1 Planning Team

The Washington County MHMP planning team is composed of individuals representing the county and its participating jurisdictions. The Washington County Emergency Management Agency acted as the designated responsible entity and coordinated the development of the planning team. Each community jurisdiction was encouraged to engage in the planning process, and invitations were sent to a wide range of community leaders and involved stakeholders. In order to complete the 10-step process outlined by FEMA in the Local Mitigation Planning Handbook, the planning team participated in a series of surveys and meetings, which are documented in the Appendices. The participation status of each incorporated jurisdiction and school district is summarized in Table 1. The Town of Fredericksburg disincorporated since the last MHMP. The location of the town has been included in this plan's maps for reference.

Table 1. Washington County Incorporated Jurisdictions and School Districts Participation

Jurisdiction Name	Jurisdiction Type	2013 Participant	Received Invitation to Participate	2018 Participant
Washington County	County	Yes	Yes	Yes
City of Salem	City	Yes	Yes	Yes
Town of Campbellsburg	Town	Yes	Yes	Yes
Town of Hardinsburg	Town	Yes	Yes	No
Town of Little York	Town	Yes	Yes	No
Town of Livonia	Town	Yes	Yes	Yes
Town of New Pekin	Town	Yes	Yes	Yes
Town of Saltillo	Town	Yes	Yes	No
East Washington Schools	School District	Yes	Yes	Yes
Salem Community Schools	School District	Yes	Yes	Yes
West Washington Schools	School District	Yes	Yes	Yes

Each chapter of the MHMP was reviewed, revised, and expanded using current information and includes new feedback from taskforce members with an emphasis on updating the goals, objectives, and strategies. The mitigation planning requirements identified in 44 CFR 201.6 call for all incorporated jurisdictions participating in a multi-jurisdictional MHMP to take part in the planning process. Examples of participation include, but are not limited to, attending planning meetings, contributing research, data or other information related to hazards and strategies, and commenting on drafts of the plan. The hazard mitigation planning team members are summarized in Table 2.

Table 2. Hazard Mitigation Planning Team

Name	Title	Organization	Jurisdiction
Desi Alexander	Director	Washington County EMA	County
Chelsea Crump	Charitable Financial Specialist	River Hills EDD & RPC	County
Phillip Marshall	Commissioner	Washington County	County
Wally Terkhorn	City Councilman	City of Salem	Salem
Joy Bierly	Executive Assistant	Salem Mayor's Office	Salem
Anita Collins	Clerk-Treasurer	Town of Livonia	Livonia
Gary Nale	Town Manager	Town of New Pekin	New Pekin
Hansley Farmer	Clerk-Treasurer	Town of Livonia	Livonia
Dr. Lynn Reed	Superintendent	Salem Community School Corporation	Salem Community School Corporation
Robert Batchelor	Safety Coordinator	West Washington School Corporation	West Washington School Corporation
Greg Hopkins	School Safety Specialists	East Washington School Corporation	East Washington School Corporation
Troy Nicholson	Director	Washington County EMS	County

All members of the planning committee were actively involved in attending meetings, providing available GIS data and historical hazard information, reviewing and providing comments on the draft plans, assisting in the public input process, and coordinating the county's formal adoption of the plan. Appendix A includes the sign-in sheets listing which meetings each team member attended along with the meeting minutes. Surrounding counties are also encouraged to be invited to participate in the planning process. Table 3 lists the counties surrounding Washington County, the name of the EMA director, and whether they participated in the process.

Table 3. Surrounding County EMAs Invited

County	Name	Attended
Jackson	Duane Davis	No
Scott	Greg Ramoni	No
Clark	Les Kavanaugh	No
Floyd	Kent E. Barrow	No
Harrison	Gregory Reas	No
Crawford	Larry Allen	No
Orange	Rick A. Emerick	No
Lawrence	Valerie A. Luchauer	No

2.2 Review of Existing Plans

Washington County and the local communities utilize land use plans, emergency response plans, municipal ordinances, and building codes to direct community development. The planning process incorporated the existing natural hazard mitigation elements from these previous planning efforts. Table 4 lists the plans, studies, reports, and ordinances used in the

development of the plan. Additional information related to jurisdiction capabilities is discussed in Chapter 5.

Table 4. Planning Documents Used for MHMP Planning Process

Author(s)	Year	Title	Description	Where Used
FEMA	2012	Resilience Report	Compiled for Washington County and the communities of Campbellsburg, Livonia, New Pekin, & Salem. A reported intended to be used by the county as a reference for management and mitigation of flood and other risks.	Section 4.3.1
FEMA National Flood Insurance Program	2017	Flood Insurance Study	Flood Insurance Study revises and supersedes the FIS reports and Flood Insurance Rate Maps (FIRMs) in the geographic area of Henry County, Indiana,	Section 4.1 major watersheds and flood areas
Christopher B. Burke Engineering, LLC	2012	IEAP for Twin-Rush Dam No. 1	An EAP is a formal document that identified potential emergency conditions at a dam & specifics actions to be followed to minimize loss of life & property damage	Section 4.3.9
Christopher B. Burke Engineering, LLC	2012	IEAP for Twin-Rush Dam No. 3	An EAP is a formal document that identified potential emergency conditions at a dam & specifics actions to be followed to minimize loss of life & property damage	Section 4.3.9

2.3 Planning Process Timeline and Steps

The Washington County planning team met on October 25th, 2018 for the MHMP update kickoff. Prior to the second meeting, the team completed a survey related to the hazard rank

and strategy status. The team then met on November 13th, 2018 to discuss survey results. The planning team confirmed the communities' hazard priorities and clarified any conflicting survey results for the county and each community.

The planning team invited the public to a meeting on December 5th, 2018. During this meeting, the overall purpose of the plan was reiterated and public input was sought. The group reviewed a copy of the draft plan and was provided with a presentation on the risk assessment and mitigation strategies. The draft plan was revised based on comments from the planning team and the public following the meetings. Appendix A includes meeting minutes and invitations to participate, and Appendix B includes the published announcement of the meeting.

The county continually works to engage with the public by posting community meetings and training opportunities on the county website as well as on the county's social media resources including Facebook and Twitter. In addition, a final copy of the plan will be available online through the county's website.

3 Community Profile

In order to provide a basic understanding of the characteristics of the community, this section offers a general overview of Washington County including the physical environment, population, and identification of available services.

3.1 General County Description

Washington County is located in south central Indiana and is situated approximately 100 miles south of the capital city of Indianapolis. According to the 2016 ACS 5-year estimates, the county covers 513 square miles and had a population of 27,792. The City of Salem is the county seat and the largest incorporated community in the county, containing approximately 22.4% of the population in 2016. Figure 2 displays a general map of Washington County and its incorporated communities while the Washington County townships and their respective incorporated communities are outlined in Table 5.

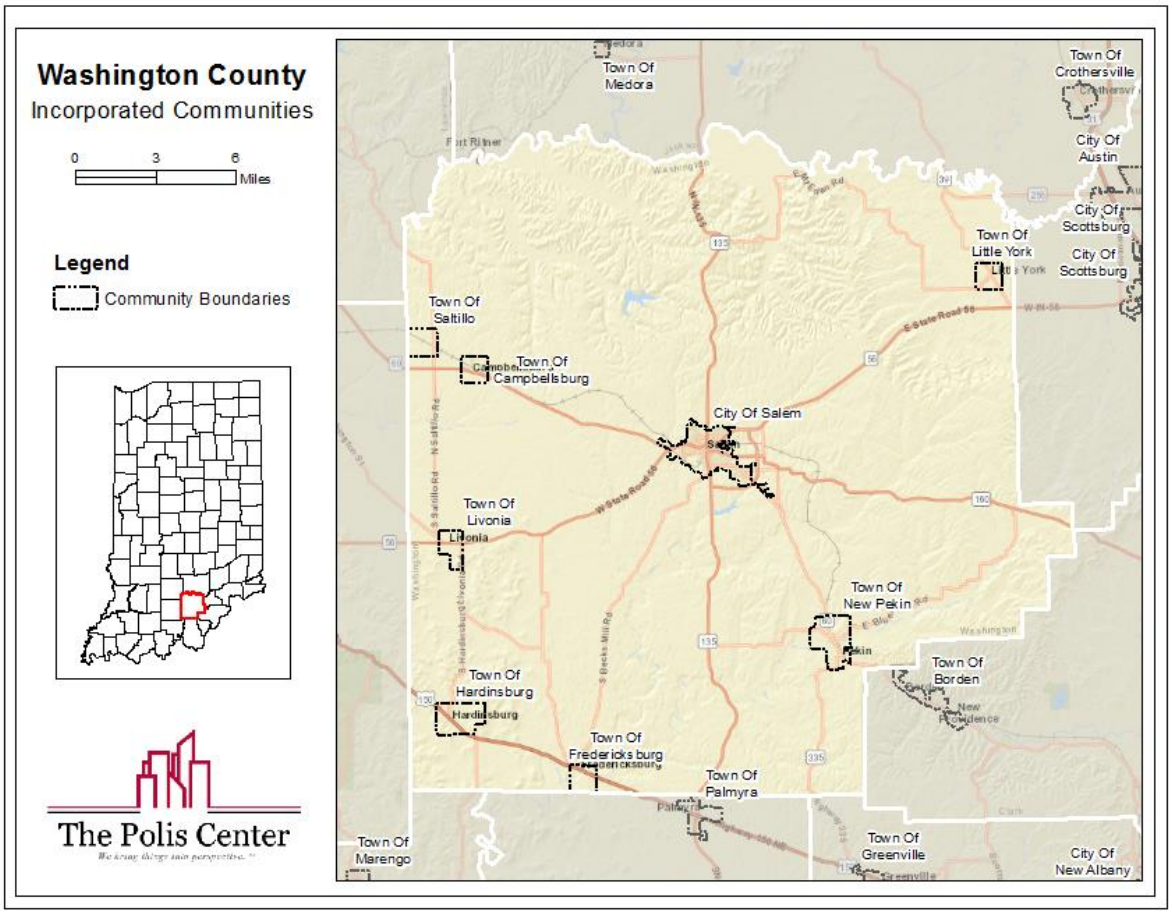

Figure 2. Washington County Incorporated Boundaries

Table 5. Washington County Townships and Incorporated Communities

Township	Communities located in Township
Brown	Campbellsburg, Saltillo
Franklin	-
Gibson	Little York
Howard	-
Jackson	-
Jefferson	-
Madison	Livonia
Monroe	-
Pierce	New Pekin (west half)
Polk	New Pekin (east half)
Posey	Hardinsburg
Vernon	-
Washington	Salem

3.2 Historical Setting

Washington County was initially settled in 1803 by Thomas Hopper and named after former U.S. President George Washington. It was officially established in 1814 when legislation took land from adjacent Clark and Harrison Counties to form Washington County.

The town of Pekin, originally established in 1818, was a regular stop on the route between Salem and New Albany. The railroad was completed in 1851 and the train station was built on the north side of the Blue River. Businesses and residents gradually migrated to this location now referred to as New Pekin.

3.3 Physical Characteristics

3.3.1 Climate and Precipitation

The Washington County climate is characteristic of southern Indiana. Winter temperatures can fall below freezing starting as early as November and extending through February. Based on National Climatic Data Center (NCDC) norms from 1981 to 2010, the average winter minimum temperature is 26.4° F and the average high is 43° F. In summer, the average low is 65.9° F and average high is 86.4° F. Average annual precipitation is 47.9 inches throughout the year. The average winter precipitation is 9.81 inches.

3.3.2 Geology and Topography

The landscape of Washington County consists of flat uplands, narrow ridges, steep-sided valleys, and lower areas along streams and drainage ways. According to the United States Department of Agriculture Soil Survey of Washington County, the lowest point in Washington County is 490 feet above sea level and the highest point in the county is about 1,050 feet above sea level.

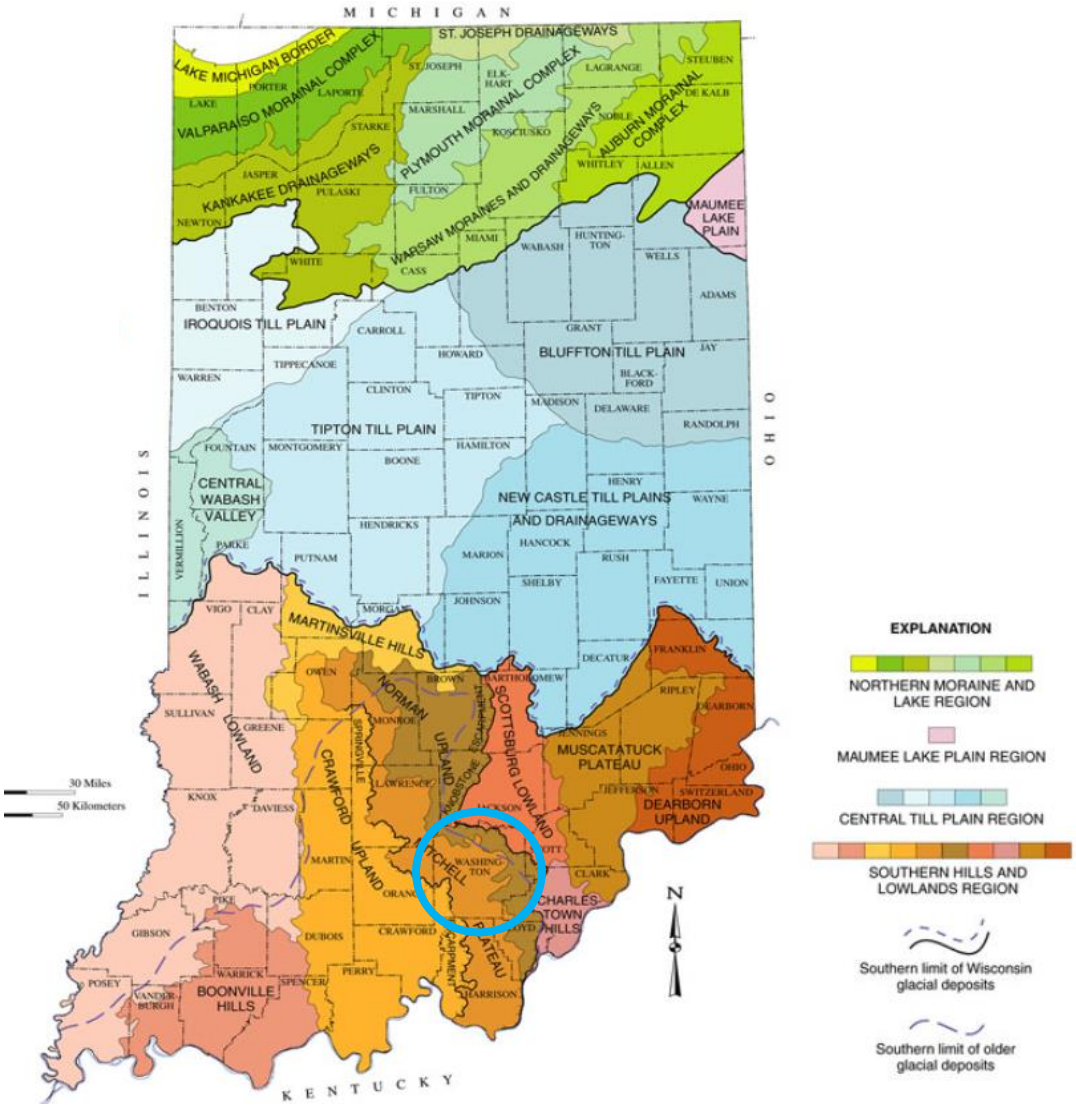

Figure 3. Physiographic Divisions of Indiana (Source: Indiana Geological Survey)

Washington County's topography falls into four topographical regions: the Scottsburg Lowland, the Norman Upland, the Mitchell Plain, and the Crawford Upland. The county is comprised mostly of unglaciated land that strongly reflected the region's bedrock structure. The topography of the Mitchell Plain is a karst area of relatively low relief and characterized by sinkholes and underlain with cave systems. The northern portion is bordered by the Muscatatuck River and the southern portion by Floyd and Harrison counties. Fertile cropland and rolling hills dominate the landscape. The Indiana Geological Survey reports that the bedrock in Washington County is primarily Mississippian and made up of shale, sandstone, siltstone, limestone, and gypsum.

3.3.3 Land Use and Ownership

3.3.3.1 Agriculture

The 2012 U.S. Census of Agriculture reports that there are 831 farms in the county covering 199,529 acres. Of this farming land, 71.6% is cropland and 4.1% is classified as "other uses." Figure 4 displays the agricultural areas in Washington County.

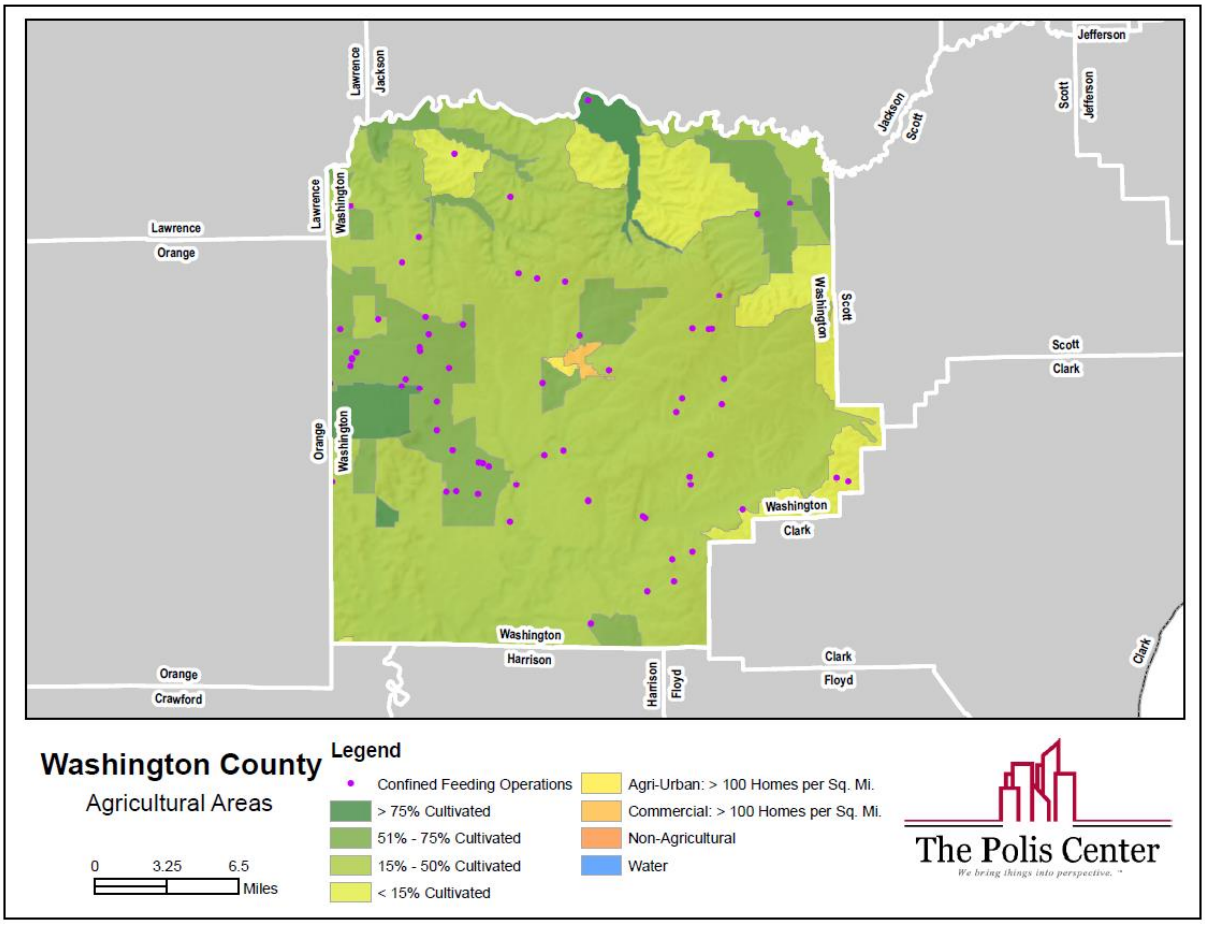

Figure 4. Washington Agricultural Areas

3.3.3.2 Managed Lands

The Indiana Department of Natural Resources (IDNR) maintains an inventory of managed properties. These natural and recreation areas are managed by either the IDNR Fish & Wildlife, IDNR Nature Preserves, federal, local or non-profits and is maintained by the Indiana Natural Heritage Database. By establishing conservation areas and parkland, the county is able to preserve plant and animal species and combat air, land, pollution prevention, and water quality issues. Figure 5 depicts managed land in Washington County.

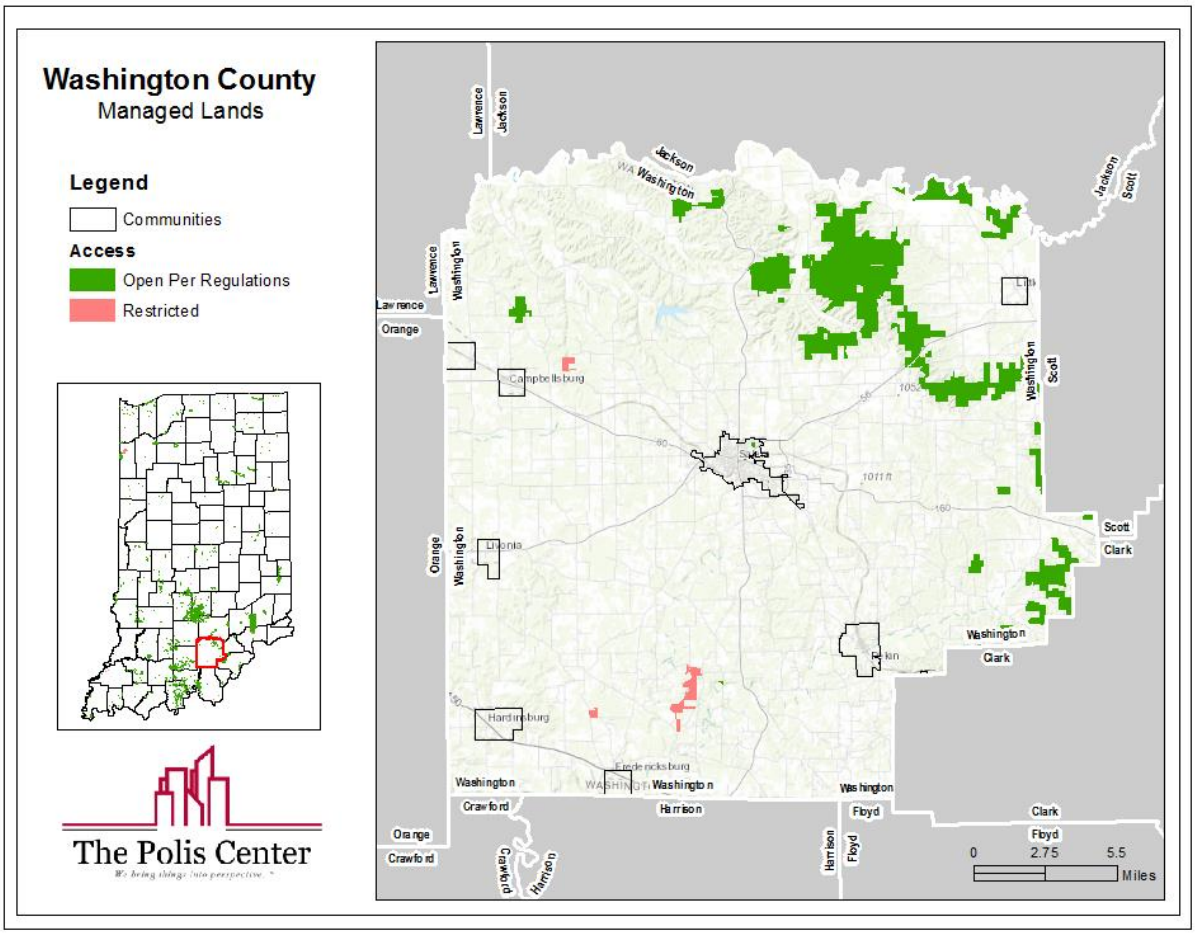

Figure 5. Washington County Managed Lands

3.3.4 Major Waterways and Watersheds

Water resources are vital to the county because they provide enhanced recreational and economic opportunities. Important water resources include surface and groundwater from aquifers, watersheds, lakes, rivers, and wetlands. Water resources provide for riparian habitats, fish, wildlife, household, livestock, recreation, aesthetic, and industrial uses.

3.3.4.1 Watersheds

Washington County is located within three major watersheds: Lower East Fork White (HUC 05120208), Muscatatuck (05120207), and Blue-Sinking (05120103) Watersheds as shown in Figure 6. The Lower East Fork White is in the north western region while the Muscatatuck Watershed is on the north eastern region of the county. The Blue-Sinking watershed covers most of the middle to southern region of the county.

3.3.4.2 Rivers and Streams

The Washington County NHD contains over 1028.5 miles of streams and rivers. Major streams and rivers in the county are displayed in Figure 6. The communities of Salem and Fredericksburg

were constructed on the banks of the Blue River. According to the Indiana Natural Resources Commission, East Fork White River is navigable throughout the county. Muscatatuck River is navigable from its junction with the East Fork of the White River throughout the county. Cammie Thomas Ditch is navigable as a channelization of the Muscatatuck River.

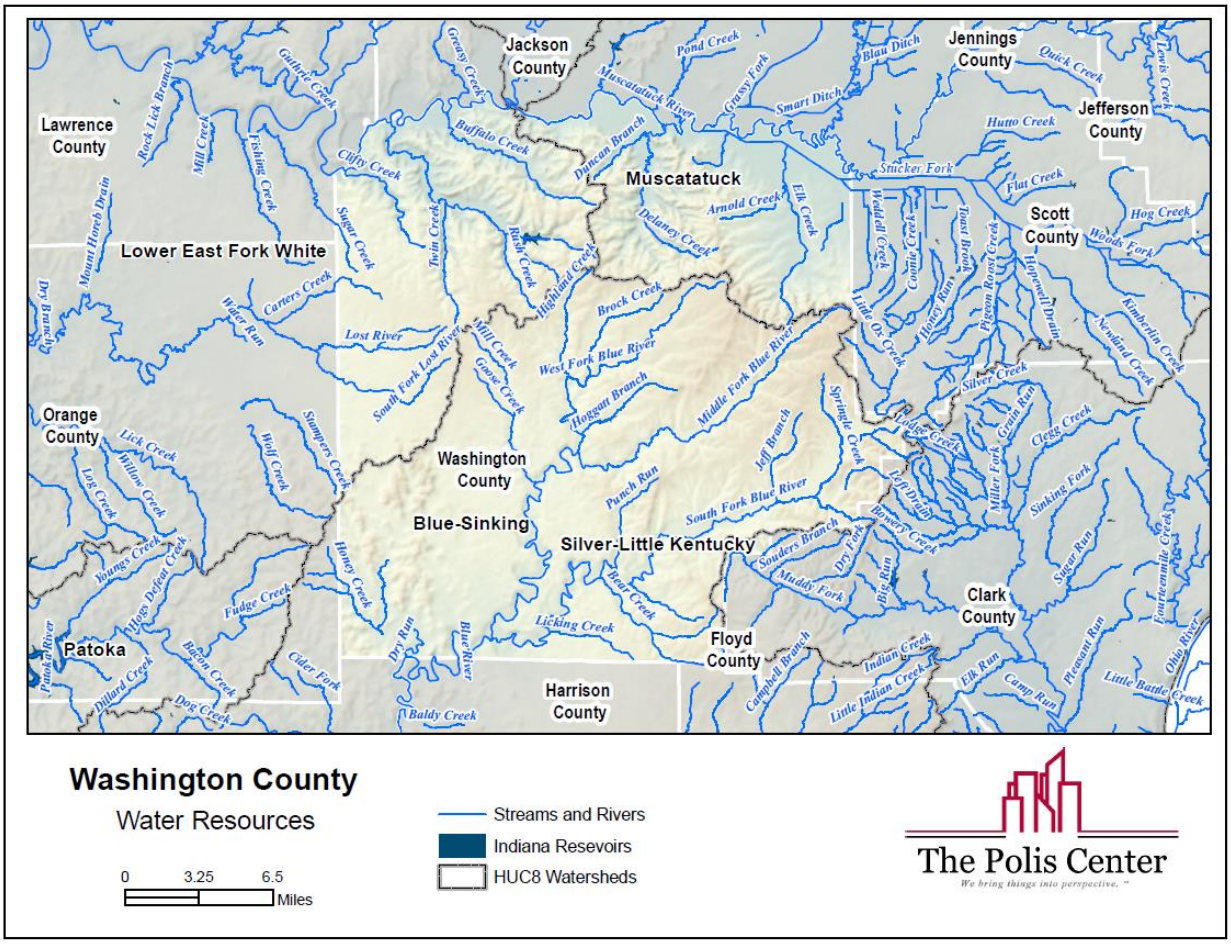

Figure 6. Washington County Water Resources (Water resource data courtesy of IDNR)

3.3.4.3 Lakes and Reservoirs

Lakes provide drinking water and a habitat for a variety of fish and wildlife. Lakes can function as a potential source of transportation and support recreational and commercial fishing industries. The DNR Department of Fish and Wildlife maintains a list of the lakes in Indiana and the general assembly has established the listing of Public Freshwater Lakes (PFL). The DNR Division of Water regulate these lakes using the Lake Preservation Act (I.C. 14-26-2) and/or Lowering of 10 Acre Lakes Act or "Ditch Act" (I.C. 14-26-5). There are no PFLs in Washington county.

3.3.4.4 Wetlands

The EPA and the IDEM have identified Indiana's wetlands and other aquatic resources as important features to protect and wisely use for the benefit of present and future generations.

Wetlands are vital features of the Indiana landscape that provide beneficial services for people and wildlife including: protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters and maintaining surface water flow during droughts and dry periods. Figure 7 displays the lakes and wetlands in Washington County.

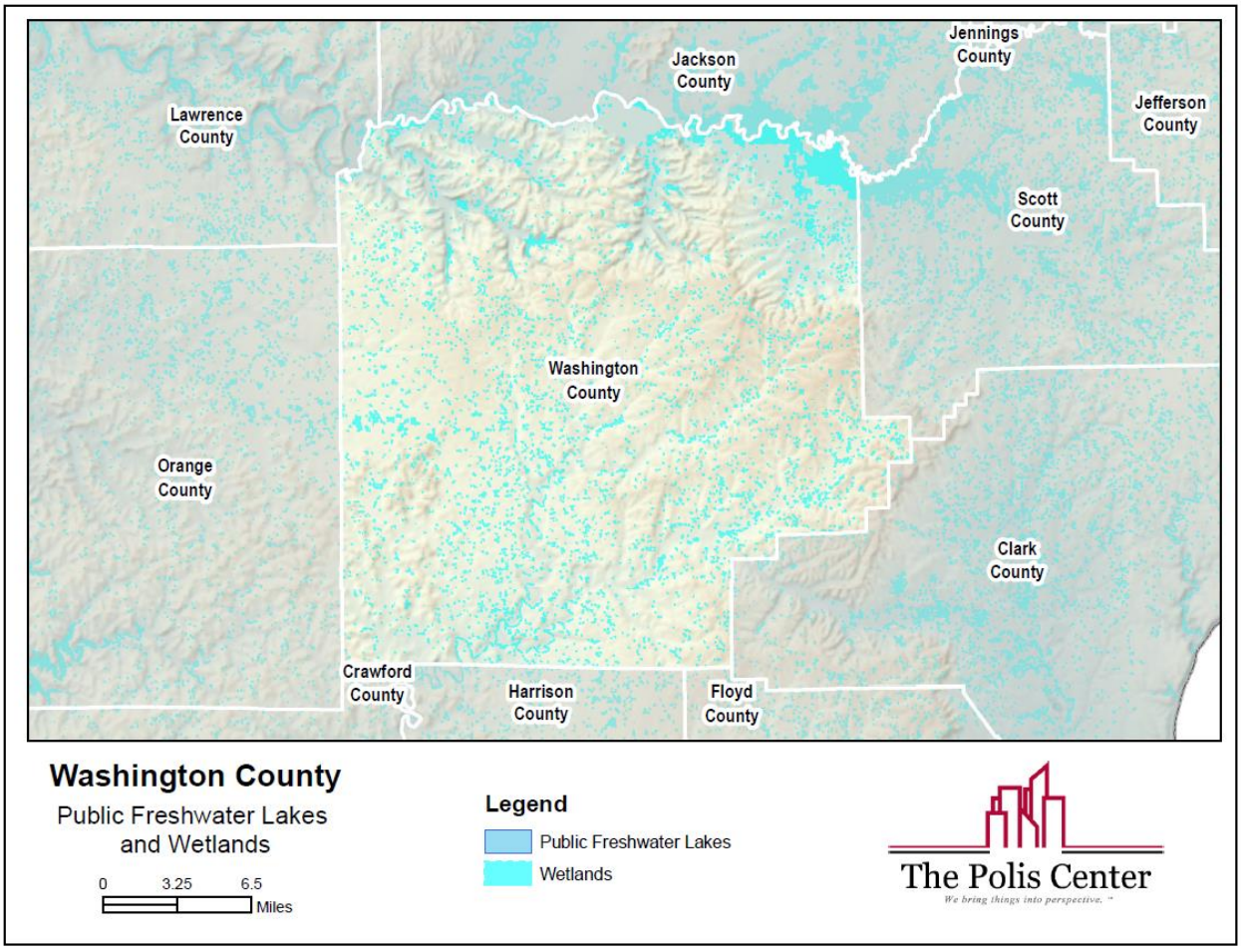

Figure 7. Public Freshwater Lakes and Wetlands (Water resource data courtesy of IDNR)

3.4 People

3.4.1 Population and Demographics

In 2010, the US Census Bureau determined that Washington County had a population of 28,262. The population decreased by 1% between 2010 and 2016. As of 2016, the ACS 5-year estimates that 27,792 people resided in Washington County with a population density of 54 people per square mile. The population of Washington County is gradually decreasing as displayed by Figure 8.

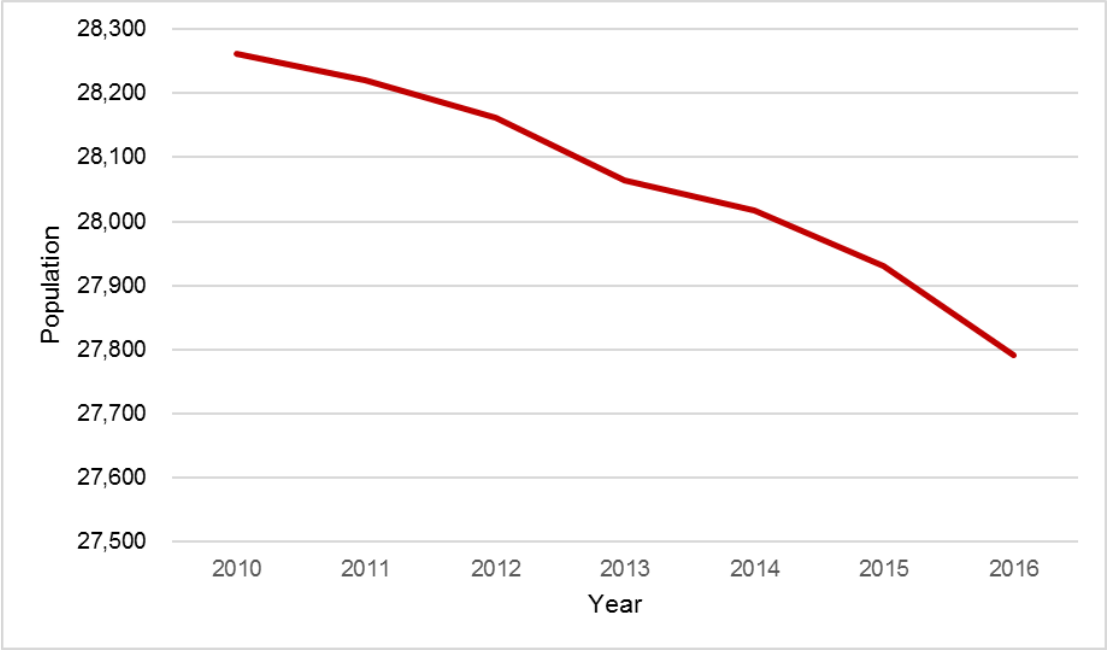

Figure 8. Washington County Yearly Population 2010-2016 (American Community Survey 5-Year Estimates)

The 2016 median age of Washington County is 41 compared to the state median of 37.4. The age distribution of Washington County is shown in Figure 9. Of the population age 25 and older, 85.5% have completed a high school education or higher while 12.7% have completed a bachelor's degree or higher.

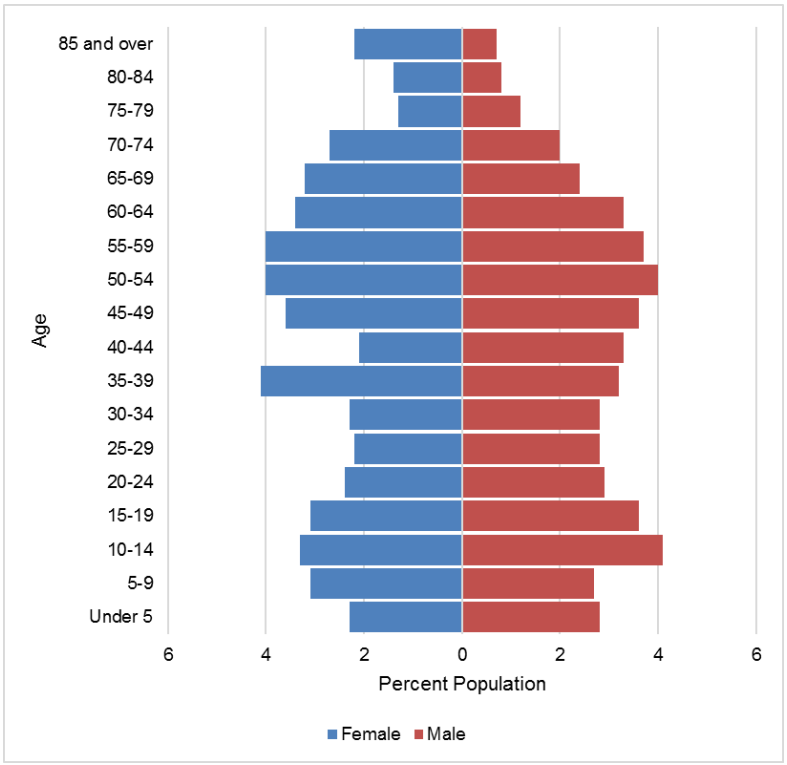

Figure 9. Distribution of Ages in Washington County (American Community Survey 5-Year Estimates)

Some populations may require special attention in mitigation planning because they may suffer more severely from the impacts of disasters. It is important to identify these populations, termed special needs populations, and develop mitigation strategies to help them become more disaster-resilient. Although there are numerous types of vulnerable populations, there are five focus groups, which include the population age 65 and over, population 25 years and over with less than a 9th grade education, population for whom poverty status is determined, population with a disability, and the population 5 years and over that speaks a language other than English at home. In Figure 10 , Washington County is compared to the nearby counties, as well as to Indiana, by the percent population of each special needs category within the county/state.

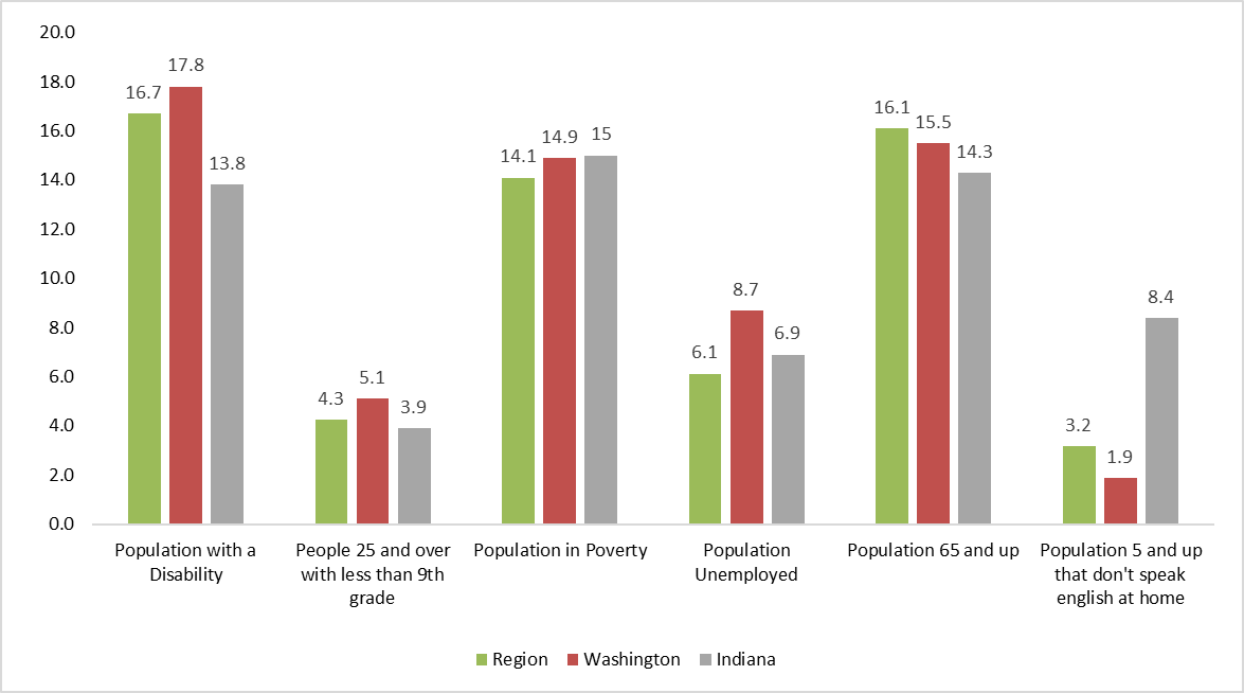

Figure 10. Special Needs Populations (American Community Survey 5-Year Estimates)

Compared to the surrounding counties, Washington County has a higher percentage of people with disabilities and a slightly higher percentage of people living in poverty. Washington County contains a lower percentage of people aged 65 and over as well as a lower percentage of people who speak a language other than English at home.

3.4.2 Housing

According to the 2016 ACS 5-year estimates, approximately 71.4% of Washington County households consist of families, compared to 65.8% of people in Indiana living with families. The county had an average household size of 2.6.

3.4.3 Economy and Employment

The 2016 annual per capita personal income in Washington County was $22,096, compared to an Indiana per capita income of $26,117. The median household income is $44,883, which is lower than the state median household income of $50,433.

Of the Washington County work force, 25.1% are employed in the manufacturing industry while educational services, and health care and social assistance accounts for 21.7% of industry. The major employers in Washington County are listed in Table 6.

Table 6. Major Employers in Washington County (HoosierData Business Lookup)

Company Name
Kimball Office Casegoods Mfg
Peerless Gear
Gkn Sinter Metals
Net Shape Technologies Inc
Walmart
John Jones Auto Group – Salem
Salem Crossing
Jay C Food Stores
Jean's Extrustions
Blue River Wood Products

3.4.4 Culture

According to the Indiana Historic Sites and Structures Inventory, Washington County has 6 historic places that appear on the National Register of Historic Places and one historic district as shown in Figure 11.

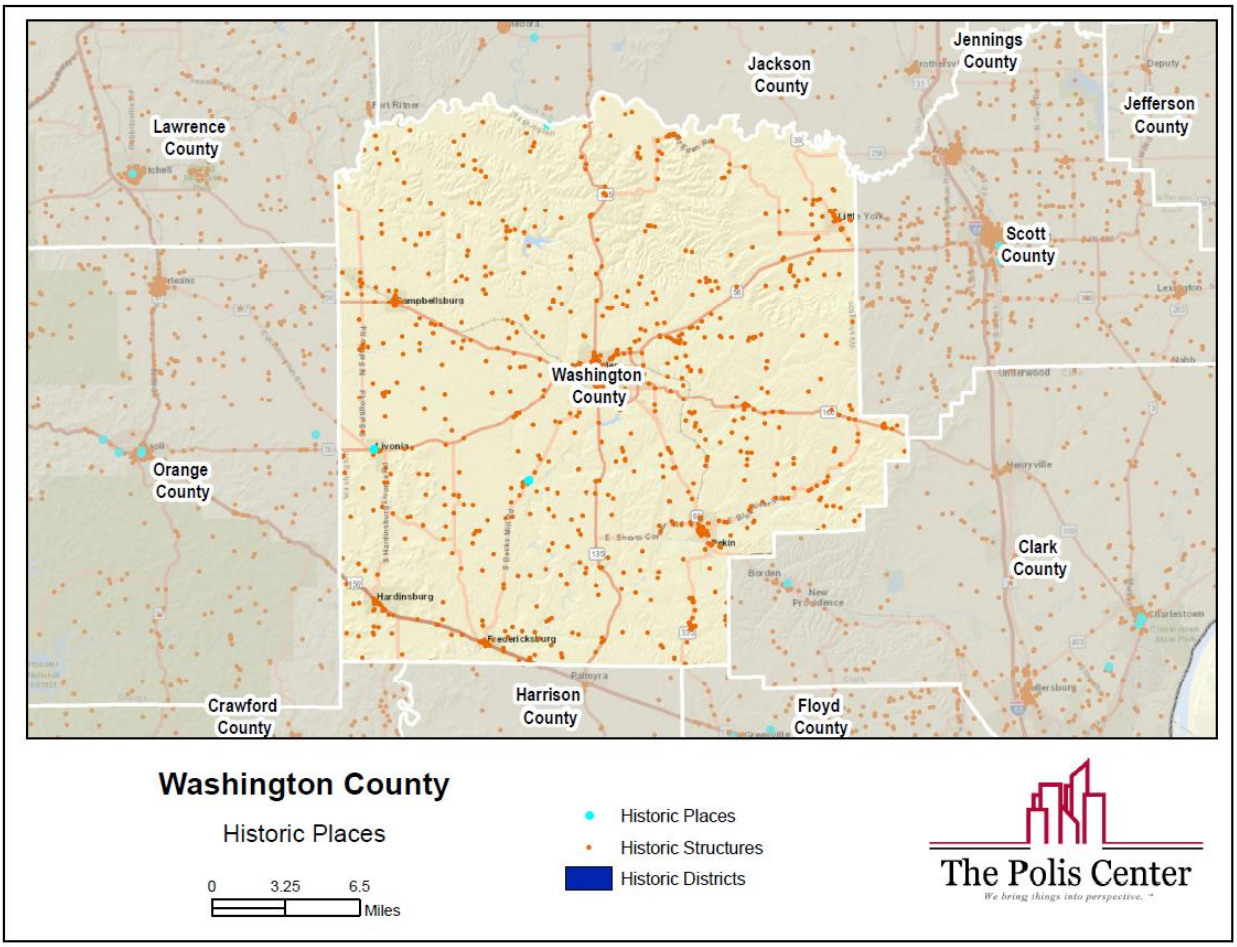

Figure 11. Historic Places in Washington County (Indiana State Historical Architectural and Archaeological Research Database)

3.4.5 Transportation and Commuting Patterns

The county transportation system is composed of roads, highways, airports, public transit, railroads, and trails, designed to serve all residents, businesses, industries and tourists. Figure 12 identifies the major transportation features of Washington County.

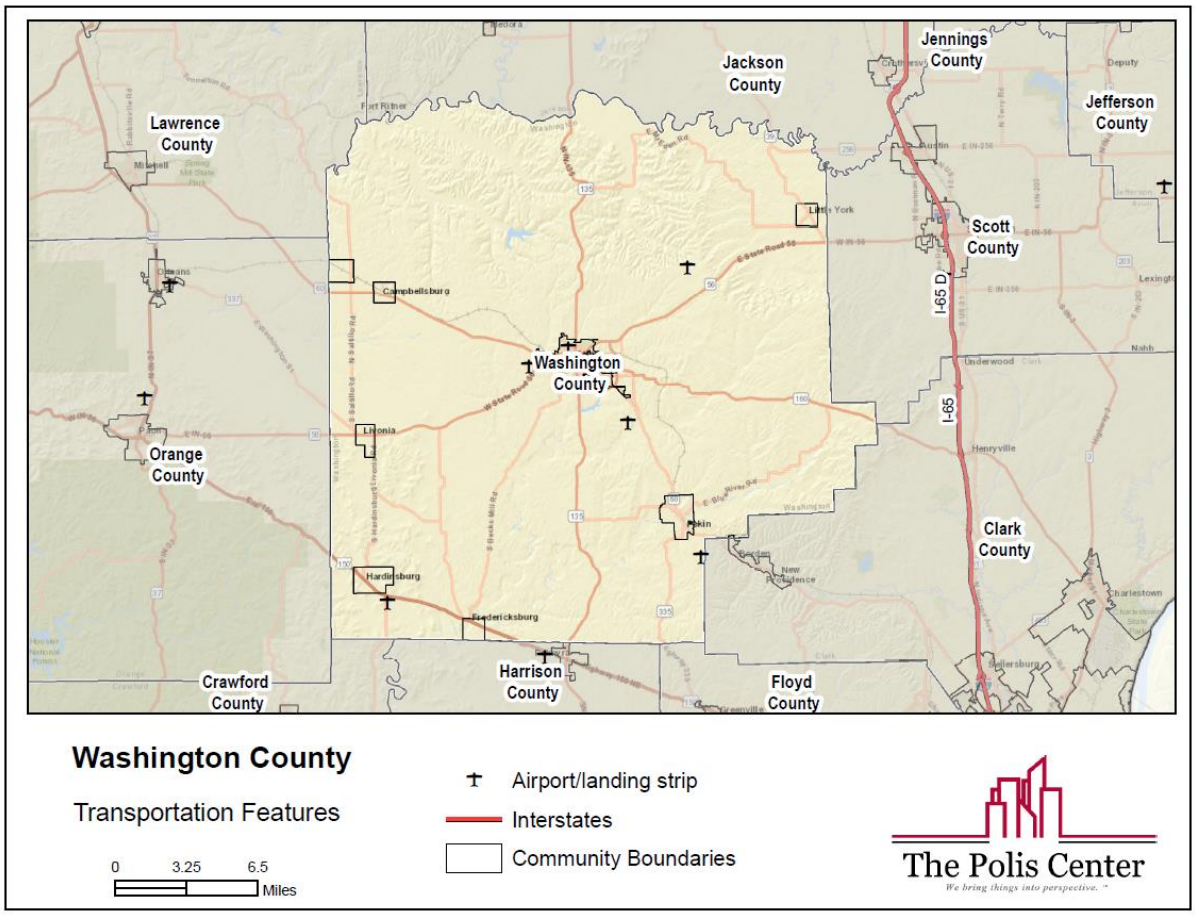

Figure 12. Washington County Major Transportation Features (Indiana Department of Transportation)

The Indiana Department of Transportation (INDOT) Fort Wayne District manages the state transportation resources. Of the 1,067 miles of road in the county, 214 are State Roads, 766 are county and 65 are under the authority of local jurisdictions.

Washington County has one main rail corridor: CSX. CSX operates 21,000 route miles in 23 states and crosses through the City of Salem.

The largest commercial airport is the Salem Municipal Airport. The nearest international air transportation is Louisville International Airport in the neighboring state. Washington County also has multiple small and privately owned airfields that can provide air access during a disaster.

Commuting Patterns

County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities. According to STATS Indiana 2016 data, 11,893 Washington residents work within the county and 5,278 work outside the county. An additional 927 people living in other counties commute to Washington County for work. Figure 13 indicates the number of workers 16 and older who commute to or from Washington County for work.

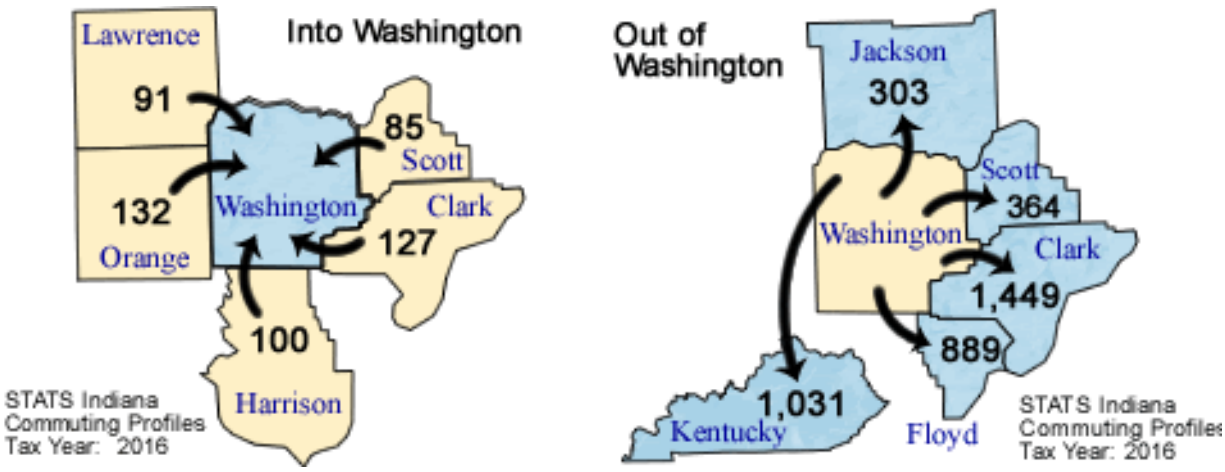

Figure 13. Commuting Patterns (STATS Indiana)

4 Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. A risk assessment consists of three components: hazard identification, vulnerability analysis, and risk analysis.

4.1 Hazard Identification/Records

4.1.1 Existing Plans

Identifying and prioritizing the hazards the community is exposed to are the first steps before conducting a risk assessment. The 2013 Washington County MHMP identified the major hazards to which Washington County is exposed. The following sections present historical data regarding hazard incidents and resultant costs in Washington County.

4.1.2 Historical Hazards

Historical storm event data was compiled from the NCDC. NCDC records are estimates of damage reported to the National Weather Service (NWS) from various local, state, and federal sources. It should be noted that these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

The NCDC data included 269 reported events in Washington County between 1965 and March 2018. The counts of these events by category is represented in Figure 14.

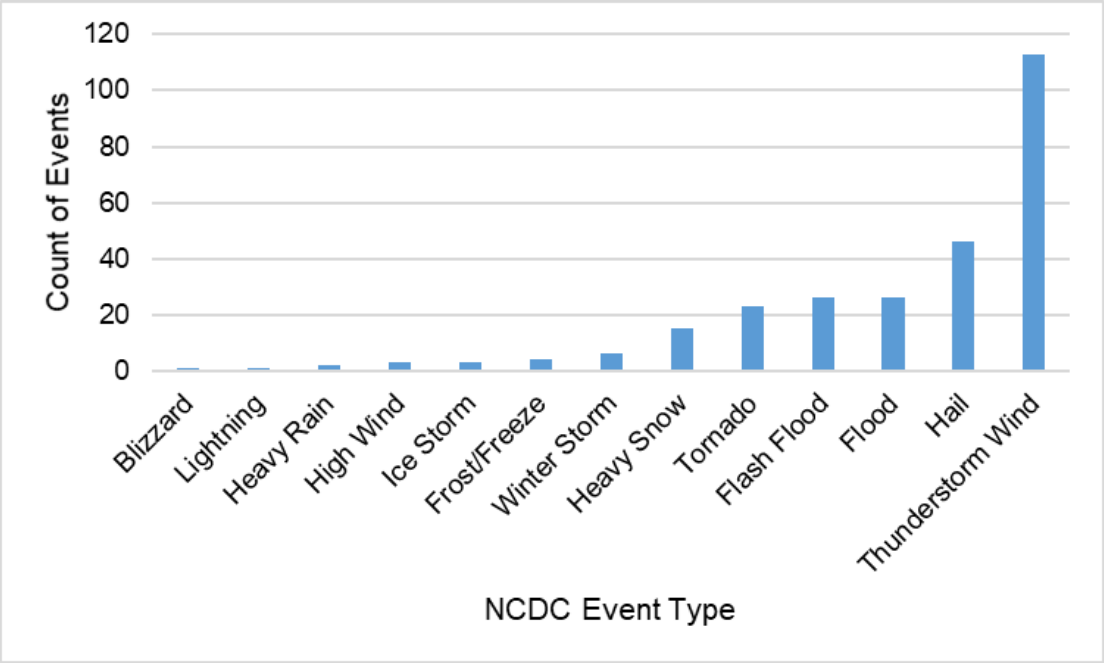

Figure 14. Count of NCDC Events in Washington County (1965-2018)

NCDC reports 61 events since the adoption of the Washington County 2013 plan. These recent events and their counts are reported in Figure 15.

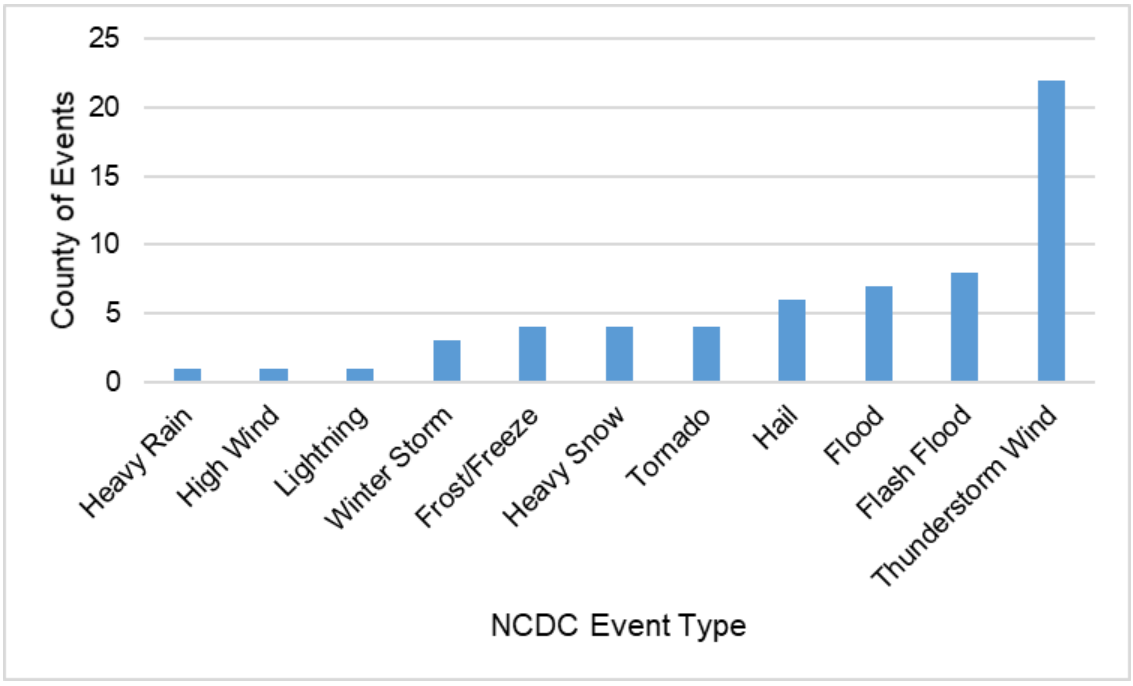

Figure 15. NCDC Events in Washington County since Previous MHMP (2013-2018)

A table listing all events and their injury, death, and property loss statistics are included in Appendix C.

4.1.3 FEMA Declared Disasters

During the past fifteen years, FEMA has declared 21 disasters for the state of Indiana. The following map shows the number disasters by county in the state since June 2004.

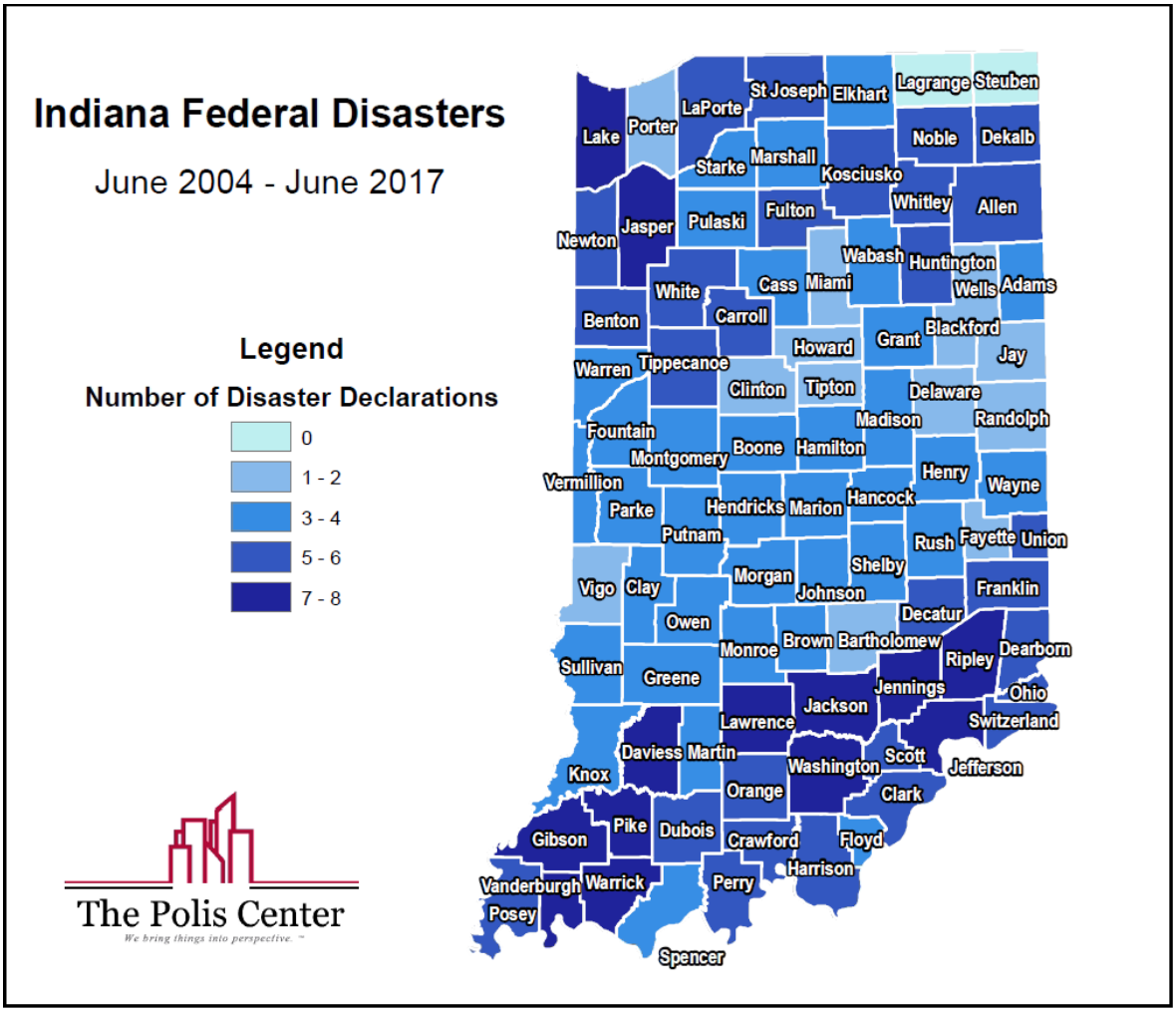

Figure 16. Disaster Declarations for Indiana

The FEMA-Declared Disasters for Washington County (2000- 2017) table shows the details of the major disaster declarations, including FEMA hazard mitigation funding and total assistance, for Washington County. Washington County has received federal aid for 8 declared disasters.

Table 7. FEMA-Declared Disasters and Emergencies for Washington County (2000-2017)

Disaster Number	Date of Incident	Date of Declaration	Disaster Description	Type of Assistance
1418	4/28/2002-6/7/2002	06/13/2002	Severe Storms, Tornadoes & Flooding	IA,PA,HMGP
1520	5/25/2004-6/25/2004	6/3/2004	Severe Storms, Tornadoes & Flooding	IA,PA,HMGP
1573	1/1/2005-2/11/2005	1/21/2005	Severe Winter Storms & Flooding	IA,PA,HMGP
1766	5/30/2008-6/24/2008	6/8/2008	Severe Storms, Tornadoes & Flooding	IA,PA,HMGP
1795	9/1/2008-10/6/2008	9/23/2008	Severe Storms & Flooding	IA,PA,HMGP
1828	1/26/2009-1/28/2009	3/5/2009	Severe Winter Storm	PA,HMGP
1997	4/19/2011-6/6/2011	6/23/2011	Severe Storms, Tornadoes, & Straight-Line Winds	PA, HMGP
4058	2/29/2012-3/3/2012	3/9/2012	Severe Storms, Straight-Line Winds & Tornadoes	PA, HMGP

Table key:

- PA – Public Assistance Program
- IA – Individual Assistance Program
- HMGP – Hazard Mitigation Grant Program

Figure 17 provides a breakdown of the public assistance to Washington County.

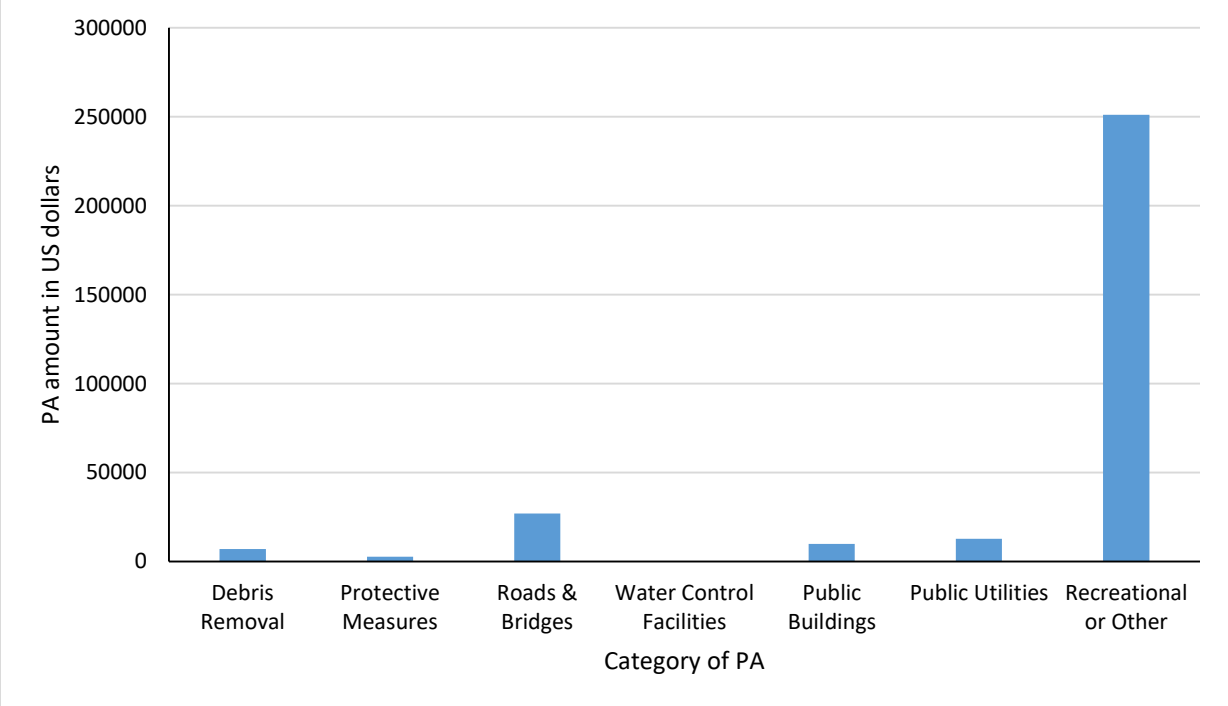

Figure 17. Indiana Disaster Public Assistance for Washington County (2004-2015)

The type of payments following a disaster help with ranking the severity of disasters and also a guide to developing mitigation activities and projects. Highway departments have claimed significant damages from flooding and fluvial erosion, and rural electrical cooperatives have historically been vulnerable to ice storms and high winds.

4.1.4 Other Disaster Relief

In addition to potential state funding, homeowners and businesses can be eligible for low-interest and long-term loans through the U.S. Small Business Administration (SBA). SBA was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns. The program also provides low-interest, long-term disaster loans to businesses of all sizes, private nonprofit organizations, homeowners, and renters following a declared disaster. The loans can also provide resources for homeowner associations, planned unit developments, co-ops, condominiums, and other common-interest developments. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Through the disaster loan program, SBA provides loan data, including FEMA and SBA disaster numbers, type (business or home), year, and various reporting amounts on the verified and approved amount of real estate and contents. outlines the SBA data for the county.

Table 8. SBA Declaration Data for Washington County

Year	FEMA Declaration	SBA Disaster Number	Community	Total Number Zip Codes Declared	Type	Total Verified Loss	Total Approved Loan Amount
2004	1520DR	IN-L0162	FREDERICKSBURG	1	Residential	$5,446	$0
2004	1520DR	IN-L0162	PEKIN	1	Residential	$949,177	$354,800
2004	1520DR	IN-L0162	PEKINS	1	Residential	$65,300	$0
2004	1520DR	IN-L0162	SALEM	1	Residential	$438,423	$61,400
2005	1573	IN-00001	PALMYRA	1	Residential	$20,344	$16,000
2005	1573	IN-00001	SALEM	1	Residential	$68,244	$26,400
2005	1573	IN-00001	VALLONIA	1	Residential	$45,075	$0
2008	1766	IN-00019	VALLONIA	1	Residential	$11,025	$0
2008	1795	IN-00026	PEKIN	1	Residential	$23,910	$0
2008	1795	IN-00026	SALEM	1	Residential	$30,955	$0
2012	4058	IN-00041	BORDEN	1	Residential	$1,156,763	$370,900
2012	4058	IN-00041	FREDERICKSBURG	1	Residential	$20,060	$20,100
2012	4058	IN-00041	HARDINSBURG	1	Residential	$19,469	$0
2012	4058	IN-00041	PEKIN	1	Residential	$5,036,513	$1,495,800
2012	4058	IN-00041	SALEM	1	Residential	$23,475	$18,500
2017	-	IN-00060	SALEM	1	Residential	$17,264	$0
2004	1520DR	IN-L0162	PEKIN	1	Business	$44,390	$0
2004	1520DR	IN-L0162	SALEM	1	Business	$8,560,767	$9,087,200
2005	1573	IN-00001	HARDINSBURG	1	Business	$58,105	$0
2005	1573	IN-00001	SCOTTSBURG	1	Business	$931,660	$0
2005	1573	IN-00001	VALLONIA	1	Business	$68,838	$0
2008	1795	IN-00026	PEKIN	1	Business	$13,867	$0
2008	1795	IN-00026	SALEM	1	Business	$24,327	$0

Year	FEMA Declaration	SBA Disaster Number	Community	Total Number Zip Codes Declared	Type	Total Verified Loss	Total Approved Loan Amount
2012	4058	IN-00041	PEKIN	1	Business	$9,728	$0
2017	-	IN-00060	SALEM	1	Business	2,171,417.00	875,500.00
2017	-	IN-00060	Salem	1	Business	8,142,771.00	0.00

4.1.5 Hazard Ranking

The Calculated Priority Rating Index (CPRI) is a process that evaluates the probability, consequence, warning time, and duration of a hazard in order to develop a hazard priority rank. The committee drew on the natural probability and impact ranked in the county's previous MHMP, the most recent CPRI assessment, community input from the hazard risk and probability survey in which communities were provided NCDC data summaries and the previous CPRI scores, and discussion from meeting two when developing a consensus on the hazard priority for the county for the purposes of this plan.

The following formula and table provide information on the weighted factors considered when determining a CPRI score for each hazard.

CPRI Risk Factor Score = [(Probability*.45) + (Consequence*.30) + (Warning Time*.15) + (Duration*.10)]

Table 9. Summary of Calculated Priority Risk Index (CPRI) Categories and Risk Levels

CPRI Category	DEGREE OF RISK			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001	1	45%
	Possible	Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001.	2	
	Likely	Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability that is greater than 0.1.	4	
Consequence	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours		4	15%
	6 to 12 hours		3	
	12 to 24 hours		2	
	More than 24 hours		1	
Duration	Less than 6 hours		1	10%
	Less than 24 hours		2	
	Less than one week		3	
	More than one week		4	

- **Probability** – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.
- **Consequence/Impact** – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability

assessment gives information that is helpful in making this determination for each community.

- **Warning Time** – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.
- **Duration** – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 10 displays the county's CPRI results for each hazard and their resultant rank.

Table 10. Calculated Priority Risk Index for Washington County

Natural Hazards	Probability	Consequence	Warning Time	Duration	Risk Factor
Tornado	4 – Highly Likely	3 - Critical	4 - < 6 hours	4 - >1 week	3.7
Hazmat Spill	2 – Possible	2- Limited	4 - < 6 hours	4 - >1 week	2.5
Flood	3 – Likely	2 - Limited	4 - < 6 hours	3 - < 1 week	2.85
Summer Storm	4 – Highly Likely	2 - Limited	3- 6-12 hours	2 - < 24 hours	3.05
Winter Storm	3 - Likely	2 - Limited	2 - 12-24 hours	3 - < 1 week	2.55
Flash Flood	4 – Highly Likely	2 - Limited	4 - < 6 hours	3 - < 1 week	3.3
Harmful Organism	2 – Possible	2 - Limited	3 - 6-12 hours	4 - > 1 week	2.35
Earthquake	2 – Possible	1 - Negligible	4 - < 6 hours	4 - > 1 week	2.2
Extreme Temperature	3 - Likely	2 - Limited	1 - 24+ hours	4 - > 1 week	2.5
Drought	2 – Possible	2 - Limited	1 - 24+ hours	4 - > 1 week	2.05
Ground Failure	1 - Unlikely	1 - Negligible	4 - < 6 hours	4 - > 1 week	1.75
Wild Fire	2 – Possible	2 – Limited	4 - < 6 hours	2 - < 24 hours	2.3
Dam Failure	1 - Unlikely	1 - Negligible	4 - < 6 hours	2 - < 24 hours	1.55
Levee Failure	1 - Unlikely	1 – Negligible	4 - < 6 hours	2 - < 24 hours	1.55

The ranking methodology in the previous Washington County plan differs from the current methodology. The previous plan marked Tornado, Flood, Winter Weather (snow & ice), and Hazardous Materials Release as Severe hazard risks. The only noticeable change in the current hazard rank is in the elevation of rank for Summer Storms. The county previously ranked summer storms as a high probability and did so again. The difference can be found in the ranking of consequence, which was rated to be critical in the update process where as previously it was ranked as having minimal consequence.

4.1.6 Hazard Risk Assessment by Jurisdiction

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. While some hazards are widespread and will impact communities similarly (e.g., winter storms), others are localized, leaving certain communities at greater risk than others (e.g., flash flooding, exposure to a particular high-risk dam). The following table illustrates each community's risk to

flooding/flash flooding, dam/levee failure, hazardous materials incidents, and ground failure and are highlighted within the risk assessment.

Table 11. Localized Hazards for Incorporated Jurisdictions

	Flooding	Flash Flooding	Dam Failure	Levee Failure	Hazardous Incident	Ground Failure
City of Salem	Highly Likely	Likely	Possible	Unlikely	Likely	Likely
Town of Campbellsburg	Likely	Possible	Unlikely	Unlikely	Possible	Likely
Town of Livonia	Likely	Likely	Unlikely	Unlikely	Possible	Likely
Town of New Pekin	Likely	Likely	Unlikely	Unlikely	Possible	Likely

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends. Determining the hazard rank is pertinent to determining the area of vulnerability. The county infrastructure and facilities inventories are a critical part of understanding the vulnerability at risk of exposure to a hazard event.

The assets presented in the analysis results are broken into two main groupings, Facilities Inventory and Building Inventory. The facilities inventory is reviewed and updated by the county before the analysis begins. The building inventory is created by the analysis team using assessor data combined with either parcel centroids or building footprints depending on what was provided by the county. The creation and update process for these two asset groups are described below.

4.2.1.1 Facilities Inventory

Of the approximately 15 facility categories, five are essential: schools, police and fire stations, medical facilities and emergency operation center(s). The remaining facilities are referred to as critical and include a variety of facility types that are critical to the everyday operations of the county. The local planning team updates these critical facilities using the previous plan GIS data as the starting point. The facilities and their counts for the county are listed in Table 12. At the beginning of the planning process these facilities were reviewed by the planning team and

updates were provided as needed to the analysis team. These updated facilities are provided to the county as well as being maintained in a statewide database by The Polis Center.

Table 12. Localized Hazards for Incorporated Jurisdictions

Facility Type	Number of Facilities
Care Facilities	15
Emergency Operations Centers	1
Fire Stations	10
Police Stations	2
Schools	13

4.2.1.2 Building Inventory

The building inventory for the county is used in the flood, earthquake, tornado, and hazmat analyses. It is created by joining the local assessor data building improvements, obtained from to the Indiana Department of Local Government and Finances (IDGLF), with either parcel centroids or building footprint data depending on what is available. This provides an estimate of the building replacement cost. For the purposes of the analysis, only replacement cost is considered which is calculated using RS Means. RS Means provides cost estimates based on square footage and construction type. The total building counts and replacement cost for the county as a whole is shown below, grouped by the occupancy code. NOTE: The assessor records often do not include nontaxable parcels and associated building improvements therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

Table 13. Building Counts and Estimated Replacement Costs for Washington County

Occupancy Code	Count	Replacement Cost
Residential	8,652	$1,378,441,306
Commercial	376	$563,597,274
Industrial	30	$249,061,542
Agriculture	2,759	$1,056,602,952
Religious	172	$262,644,241
Government	110	$105,705,282
Education	9	$368,997,245
Total	12,108	$3,985,049,845

4.2.2 Hazus-MH

The initial Multi-Hazard Mitigation Plan (MHMP) for Washington County, Indiana was submitted to FEMA and approved in 2011. Existing Hazus-MH technology was used in the development of the vulnerability assessment for flooding and earthquakes.

It is important to note that Hazus-MH does not a substitute for detailed engineering studies. Rather, it serves as a planning aid for communities interested in assessing their risk to flood, earthquake, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project.

4.2.3 Past & Future Development

Recent or proposed development, especially in Special Flood Hazard Areas (SFHAs), must be carefully evaluated to ensure that no adverse impacts occur as a result. Development, whether it is a 100-lot subdivision or a single lot big box commercial outlet, can result in large amounts of fill and other material being deposited in flood storage areas or other vulnerable locations.

As the county's population shifts and develops, the residential and urban areas may extend further into the county, placing more pressure on existing transportation and utility infrastructure while increasing the rate of farmland conversion. Washington County addresses specific mitigation strategies in Chapter 5 to alleviate such issues.

Because Washington County is vulnerable to a variety of natural and technological threats, the county government, in partnership with the state government, is committed to preparing for the management of these type of events for better emergency management and county response.

According to the Indiana Department of Local Government Finance, 300 of Washington County's parcels have experience some sort of construction since 2012. Of those, 35 are located within either the special flood hazard areas, the tornado path area or the toxic plume area, identified in sections, 4.3.1, 4.3.4, and 4.3.8 of this plan. While these new constructions might have increase the vulnerability of the county to those hazards, they are only a small portion (12%) of the recent years' development.

4.3 Hazard Profiles

The following hazard profiles outline the hazard risk exposure for the county. The hazard is first described and then reviewed in the historical context of the county. In many cases, an analysis subsequently follows the hazard context that analyzes the facility and building inventory risk.

4.3.1 Flash Flood and Riverine Flood

4.3.1.1 Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the US. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry of the catchment, and flow dynamics and conditions in and along the river channel. Floods in Washington County can be classified as one of two types: flash floods or riverine floods, which are both common in Indiana.

Flash floods generally occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally-intense damage and, sometimes, loss of life due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person, while another 18 inches might carry off a car. Generally, flash floods cause damage over relatively localized areas, but they can be quite severe in the areas in which they occur. Urban flooding is a type of flash flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Flash floods can occur at any time of the year in Indiana, but they are most common in the spring and summer months.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for riverine floods than for flash floods, generally providing ample warning for people to move to safe locations and, to some extent, secure property against damage. Riverine flooding on the large rivers of Indiana generally occurs during either the spring or summer.

4.3.1.2 Stream gages

The USGS, in cooperation with many state agencies and local utility and surveyor offices, help maintain stream gages, which provide the capability to obtain estimates of the amount of water flowing in streams and rivers. IDNR and IDEM use the stream gage data for water quantity and quality measurements. Local public safety officials use the data at these sites, along with the resources from the NWS, to determine emergency management needs during periods of heavy rainfall. The location of stream gages in the county are shown in Figure 18.

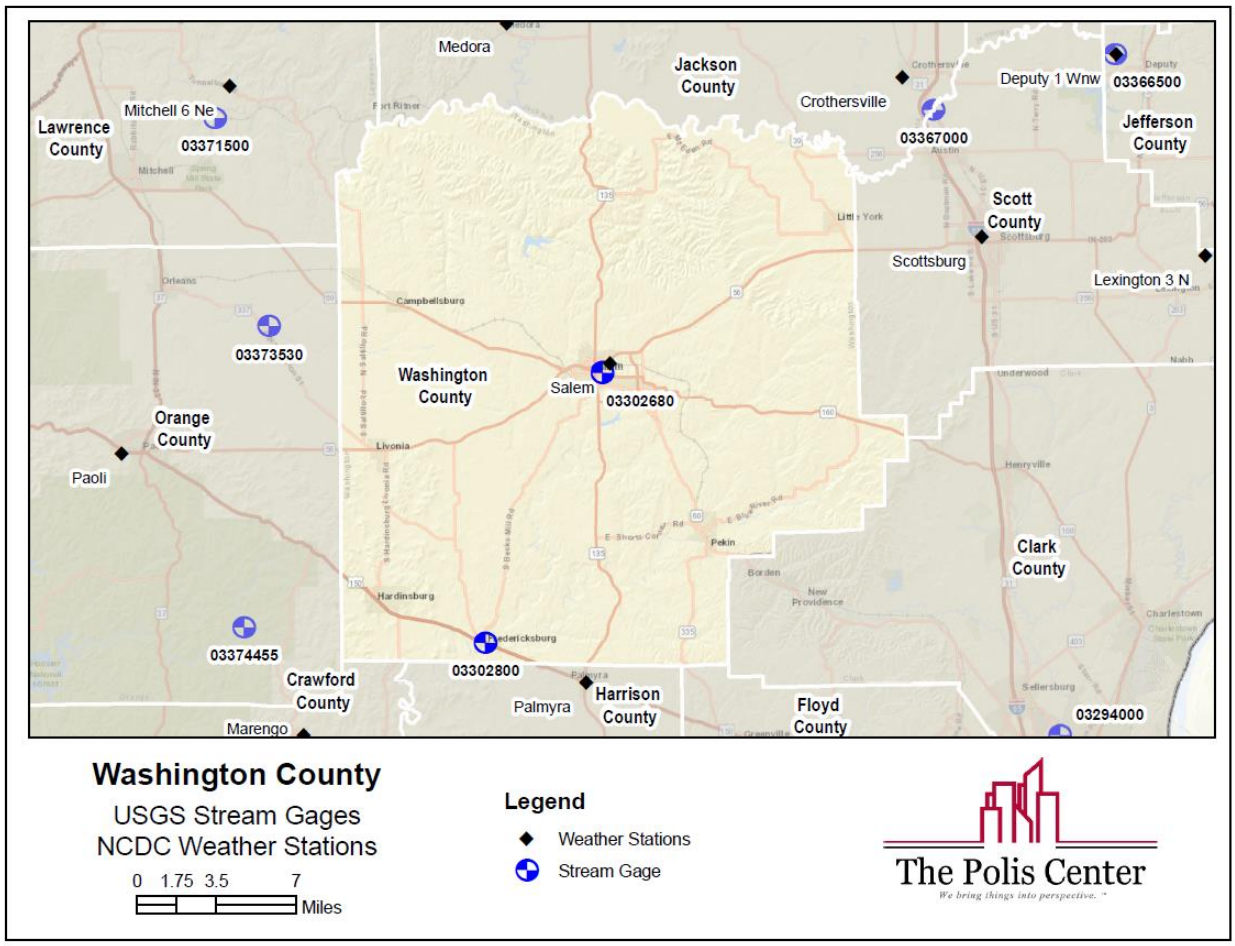

Figure 18. USGS Stream Gages and NCDC Weather Stations

4.3.1.3 Flood History in Washington County

Washington County has experienced a total of 52 flooding events since 1996. Since 2012 there have been 8 reported incidents of flash flooding and 7 reports of flooding. In June of 2013, the Washington County Emergency Manager reported that numerous roads across the county were briefly closed due to flash flooding. State officials reported flash flooding in April of 2015 due to heavy rainfall which caused an unusual amount of high water on roads in Salem, forcing them to be barricaded. In May of 2017, a flooding event was reported by law enforcement that caused $40,000 in property damage. Several inches of rain fell in a very short time period resulting in flash flooding across many portions of the county. This event also resulted in multiple high water rescues; no injuries or deaths were reported. Additional details for NCDC events are included in Appendix C.

4.3.1.4 Geographic Location for Flooding

Most river flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Severe thunderstorms may cause flooding during the summer or fall, but tend to be localized. According to the Washington County Flood Insurance

Study (FIS), principal flood areas are the low-lying areas along Henry Creek in the Town of Little York, South Fork Blue River in the Town of Pekin, and Brock Creek, Highland Creek and West Fork Blue River in the City of Salem.

Flash floods, brief heavy flows in small streams or normally dry creek beds, also occur within the county. Flash flooding is typically characterized by high-velocity water, often carrying large amounts of debris. Urban flooding involves the overflow of storm drain systems and is typically the result of inadequate drainage following heavy rainfall or rapid snowmelt.

4.3.1.5 Hazard Extent for Flooding

The Special Flood Hazard Areas (SFHA) are defined as the areas that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood is also referred to as the base flood or 100-year flood. The SFHAs in Washington County are identified in Figure 19.

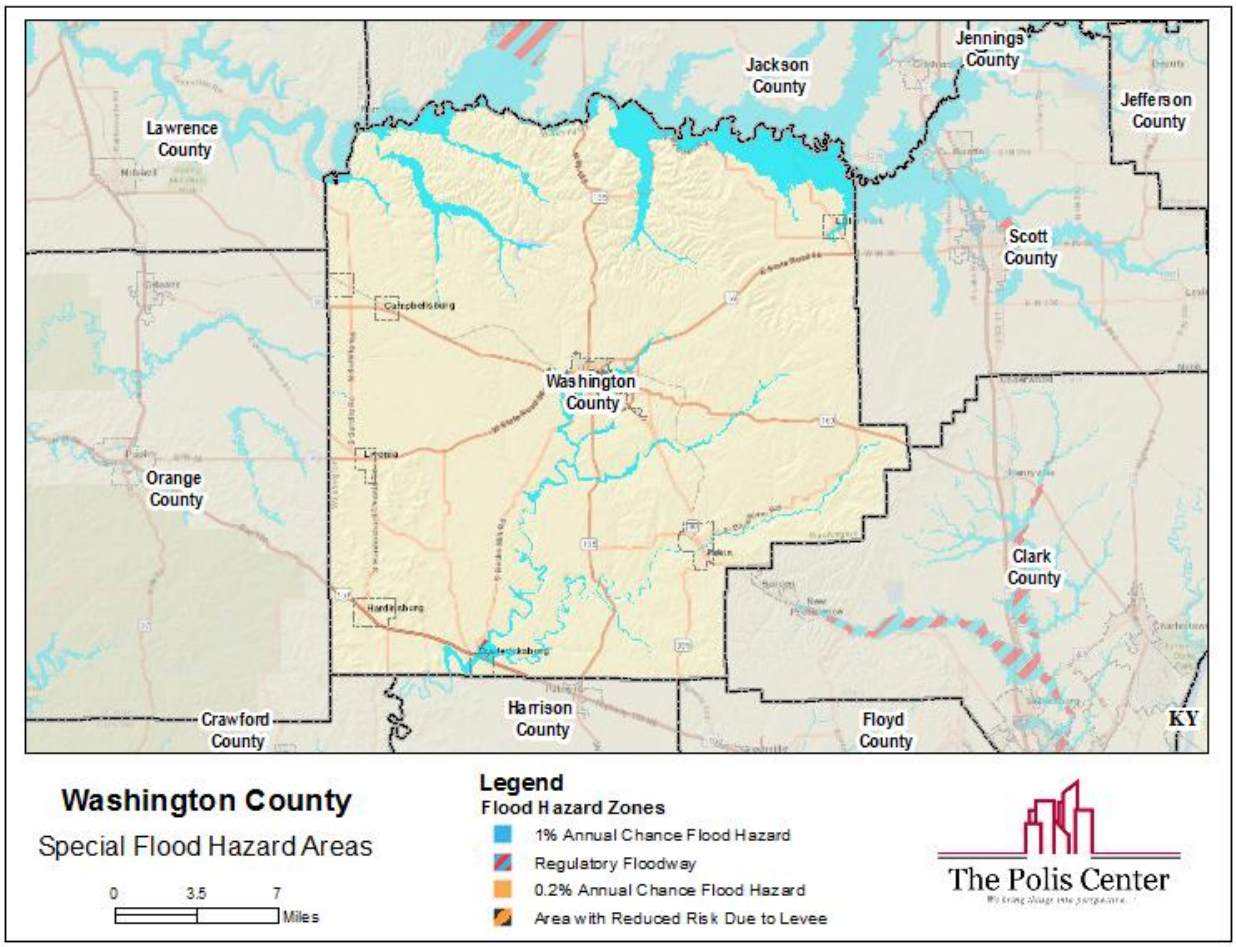

Figure 19. Special Flood Hazard Areas (SFHA) in Washington County

NFIP Analysis

If a structure is located in a high-risk area, the 1% annual chance flood hazard, and the owner has a mortgage, they are required to purchase flood insurance through a federally regulated or insured lender. Flood insurance is not federally required in moderate- to low-risk areas, but it is still a good idea. The National Flood Insurance Program (NFIP) is a program in which, if a community enforces a floodplain management ordinance, the federal government will make flood insurance available in order to protect against flood loss.

Since the NFIP plays such a vital role in mitigating flood risk, understanding the status of hazard maps and reported losses occurring can provide insight on new strategies to mitigate the impacts and losses of future events. The communities in Washington County that participate in the NFIP, their NFIP number, current effective map date, and program entry date are provided in Table 14.

Table 14. NFIP Participation and Mapping Dates

NFIP Community	CID	Effective Map Date	Join Date
Washington County	180446A	06/21/17	06/21/17
Salem	180279A	06/21/17	08/15/78
Communities in SFHA but NOT in NFIP			
Little York	180398A	06/21/17	-
New Pekin	180463S	06/21/17	-

FEMA provides annual funding through the National Flood Insurance Fund (NFIF) to reduce the risk of flood damage to existing buildings and infrastructure. These grants include Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and the Severe Repetitive Loss (SRC) program. The long-term goal is to significantly reduce or eliminate claims under the NFIP through mitigation activities.

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which has suffered flood loss damage on two occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is 25% of the market value of the structure at the time of each flood loss.

The Indiana State NFIP Coordinator and FEMA Region V were contacted to determine the location of repetitive loss structures. FEMA Region V reported 4 single-family structures in Fredericksburg, 1 single-family & 1 non-residential structure in Salem, and 3 single-family structures in unincorporated Washington County. There were no severe repetitive losses reported for the county. Table 15 documents the Washington County NFIP claims data as of 12/31/2017.

Table 15. NFIP Claims Data for Washington County

Community	Number of Policies	Value of Insurance Claims/Pmts	Total Num. Losses Submitted
Washington County	27	$715,200	15
City of Salem	13	$1,627,600	25
Town of Fredricksburg	-	-	13

To help understand flood risk, the total structures in the SFHA are compared to the total number of policies in the community. This is based on approximate building locations, and therefore should not be used as an absolute comparison. However, this information may be used to target further mitigation through further engagement with the NFIP. In addition, this may be a tool to help understand if there would be an interest in becoming involved in a discount program with the Community Rating System (CRS). Table 16 provides a comparison of number of buildings in the 1% flood probability boundary to the number of policies, and then provides a percent of insured structures represented by those policies. The last column in the table provides an estimate of the exposure that is insured.

Table 16. Comparison of Estimated Building Exposure to Insured Buildings

Community	Buildings in 100 Year Floodplain*	Exposure of Buildings in Floodplain	Number of Policies	Value of Insurance Claims/ Pmts	Approximate Percent of Buildings Insured	Approximate Percent of Exposure Insured
Washington (Unincorp.)	131	$20,094,637	27	$715,200	21%	4%
Fredricksburg	24	$7,052,673	-	-	0%	0%
New Pekin	2	$307,697	-	-	0%	0%
Little York	19	$3,445,889	-	-	0%	0%
Salem	55	$60,773,159	13	$1,627,600	24%	3%
Total	231	$91,674,058	40	$2,342,800	17%	3%

* The count and exposure of buildings in the floodplain reported in this table is based on an account of all structures in the floodplain that were represented in the county property assessment data.

4.3.1.6 Risk Identification for Flood Hazard

In Meeting #2, the planning team determined that the probability of flooding is likely with limited consequences, whereas flash flooding is highly likely to occur with limited consequences. Flooding and Flash flooding both have a warning time of less than 6 hours. Flooding and Flash flooding's duration was determined less than 1 week. The calculated CPRI for flooding is 2.85, while the CPRI for flash flooding is 3.3.

4.3.1.7 Vulnerability Analysis for Flash Flooding

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

4.3.1.8 Hazus-MH Analysis Using 100 Year (1% chance) Flood Boundary

Hazus-MH was used to estimate the damages incurred for a 1% annual chance flood event in Washington County using the SFHA and a 10-meter DEM (digital elevation model) to create a flood depth grid. Hazus-MH was then used to perform a user-defined facility (UDF) analysis of Washington County. The UDFs were defined by intersecting the Hazus-MH generated flood depth grid with the Washington County building inventory. These data were then analyzed to determine the depth of water at the location of each building point and then related to depth damage curves to determine the building losses for each structure.

Hazus-MH estimates the SFHAs would damage 231 buildings county-wide at a cost of $49 million. In the modeled scenario, the unincorporated areas of Washington County contained the most damaged buildings but the town or city with the most damage was Salem, with 55 buildings damaged at a cost of almost $30 million. The total estimated numbers and cost of damaged buildings by community are given in Table 17 and Table 18. Figure 20 depicts the Washington County buildings that fall within the SFHA. Figure 21 through Figure 24 display community maps of buildings that fall within the SFHA.

Table 17. Estimated Number of Buildings Damaged by Community and Occupancy Class

Community	Total Buildings Damaged	Building Occupancy Class						
		Agr.	Comm.	Educ.	Govt.	Industrial	Religious	Residential
Washington (Unincorp.)	131	40	1	0	1	0	1	88
Fredricksburg	24	2	2	0	4	0	1	15
New Pekin	2	0	0	0	0	0	0	2
Little York	19	4	0	0	0	0	0	15
Salem	55	0	16	0	6	3	0	30
Total	231	46	19	0	11	3	2	150

Table 18. Estimated Cost of Buildings Damaged by Community and Occupancy Class

Community	Cost Buildings Damaged	Building Occupancy Class						
		Agr.	Comm.	Educ.	Govt.	Industrial	Religious	Residential
Washington (Unincorp.)	$11,868,313	$5,060,561	$510,742	$0	$196,650	$0	$81,594	$6,018,766
Fredricksburg	$3,541,453	$409,039	$557,687	$0	$617,540	$0	$197,004	$1,760,183
New Pekin	$25,107	$0	$0	$0	$0	$0	$0	$25,107
Little York	$2,656,378	$832,047	$0	$0	$0	$0	$0	$1,824,331
Salem	$30,997,022	$0	$17,774,582	$0	$1,680,628	$8,957,927	$0	$2,583,885
Total	$49,088,273	$6,301,647	$18,843,011	$0	$2,494,818	$8,957,927	$278,598	$12,212,272

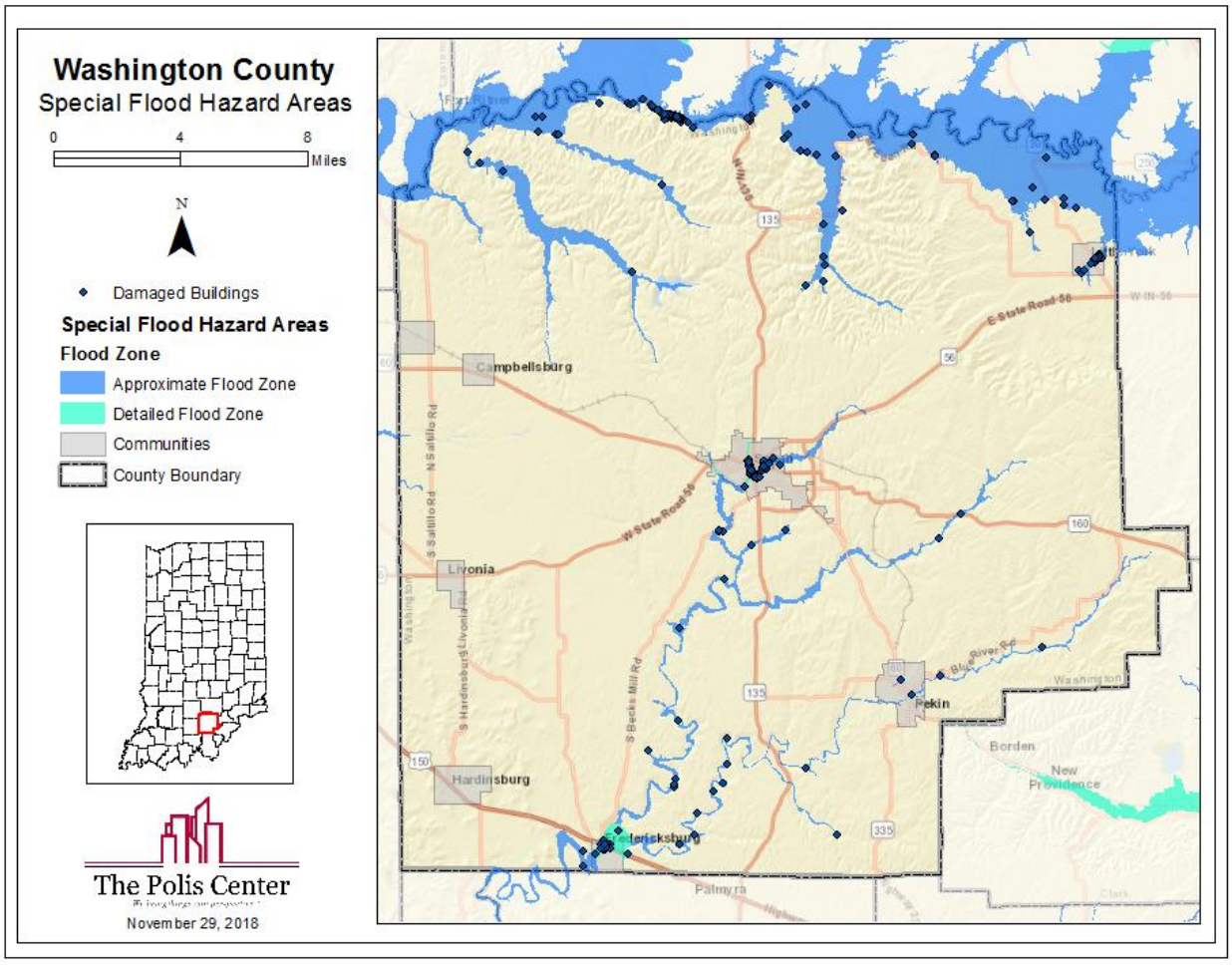

Figure 20. Estimated Buildings Damaged in SFHA

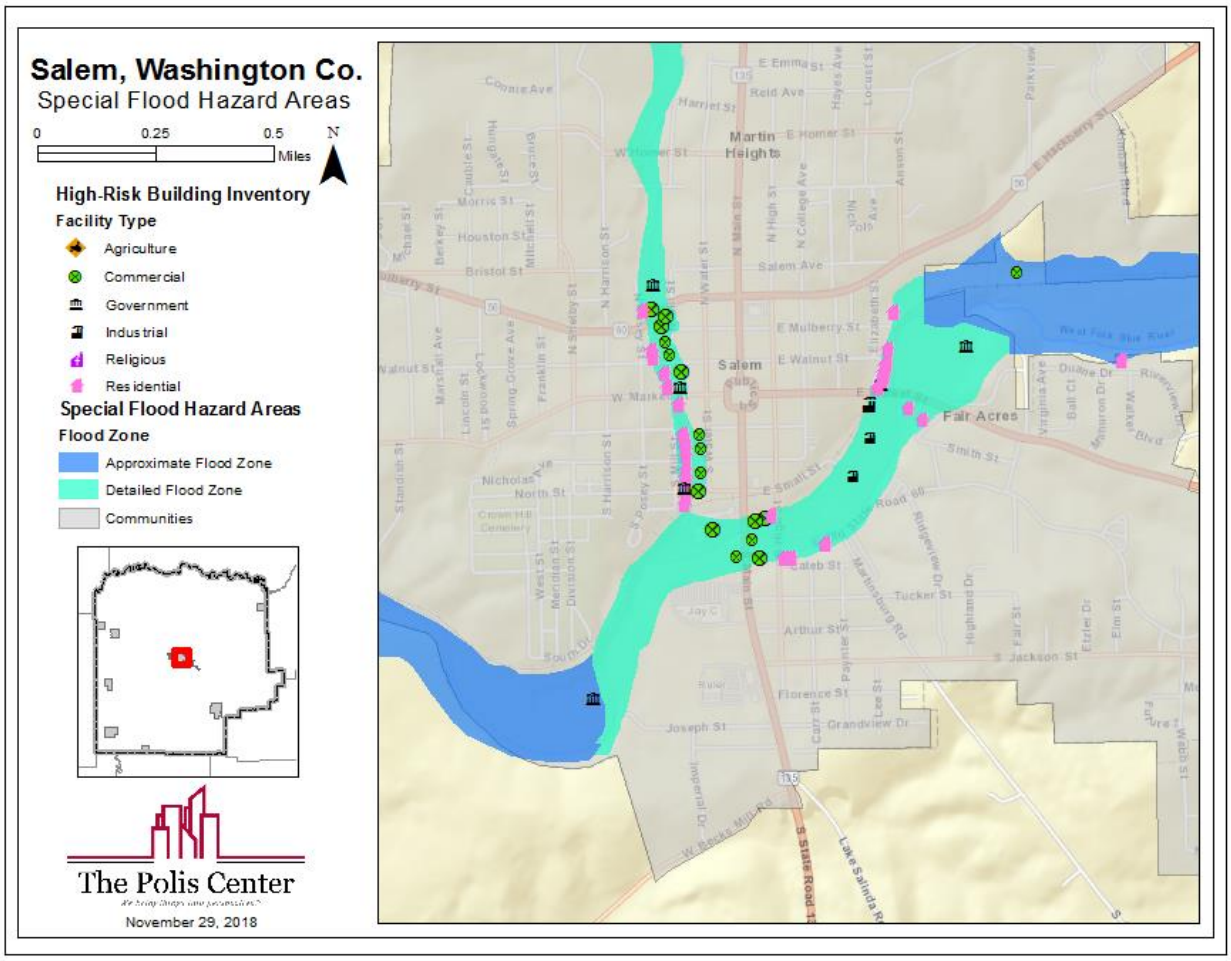

Figure 21. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

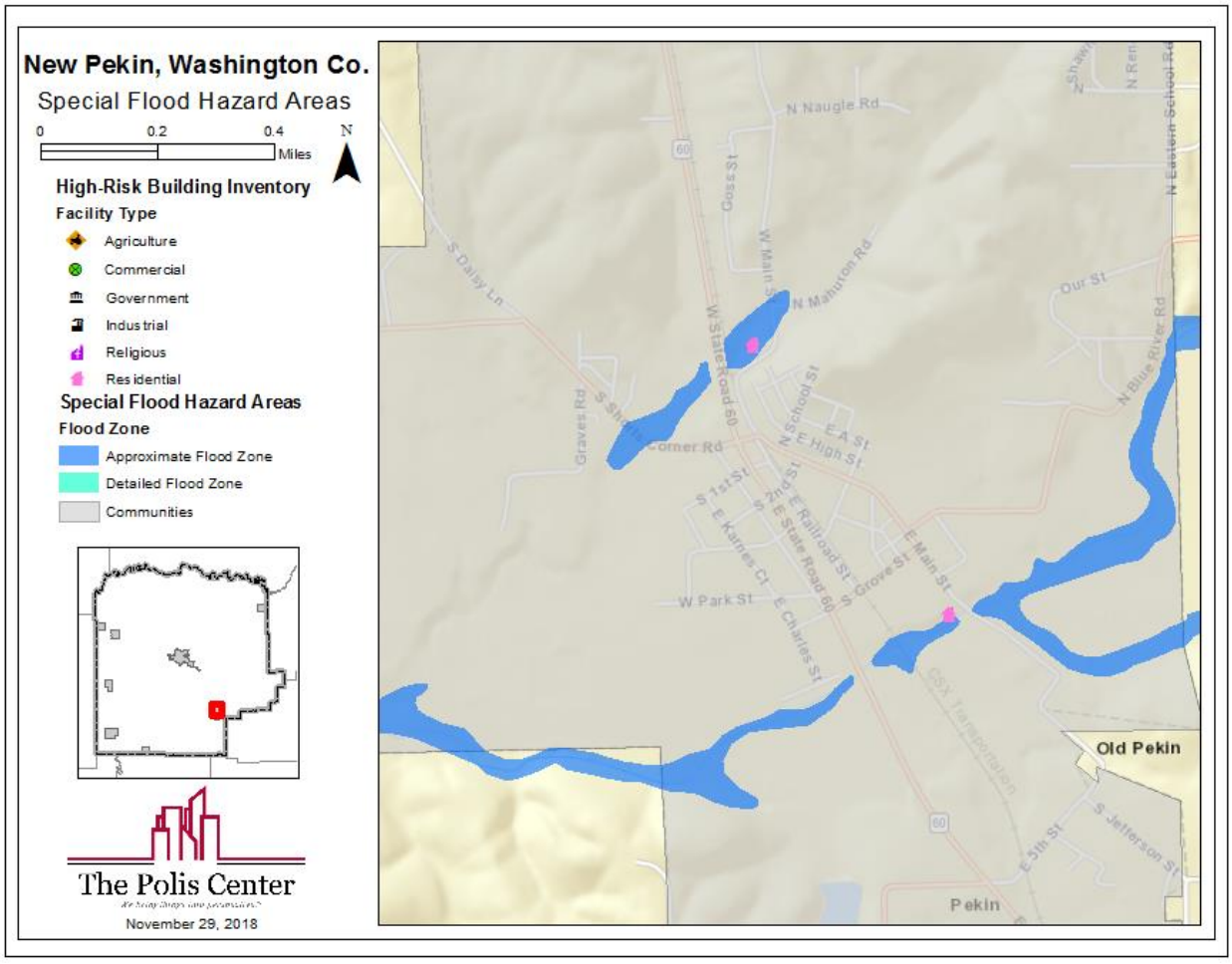

Figure 22. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

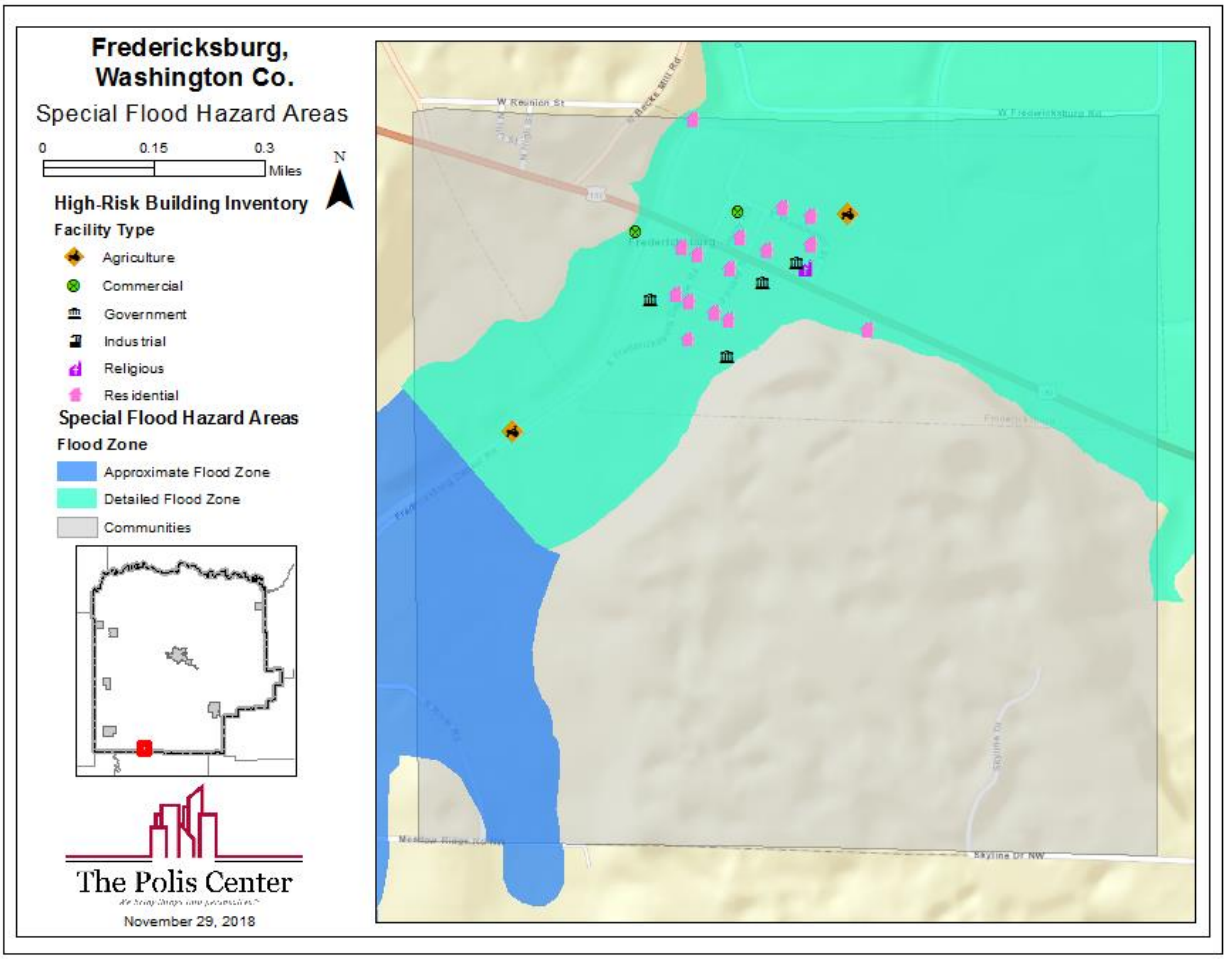

Figure 23. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

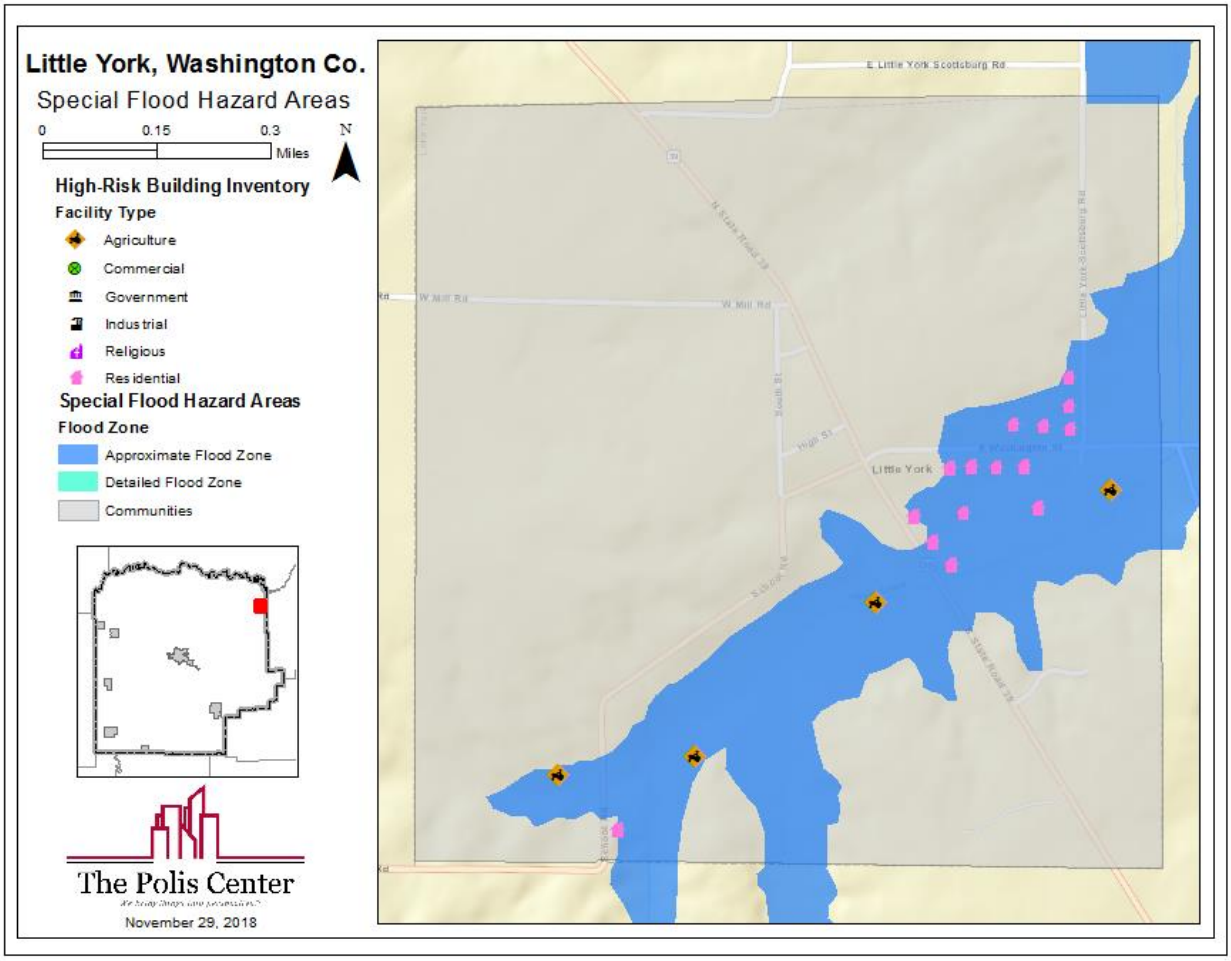

Figure 24. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

Overlay Analysis of Essential Facilities

Essential and other critical facilities can become damaged during the 1% annual chance flood. Damages to these types of facilities can severely impact the ability of the community to respond and recover from disasters. In Washington County, no essential facilities were modeled as having sustained damaged in the 1% annual chance flood. The critical facilities that can become damaged during the 1% annual chance flood have been mapped in Appendix D.

4.3.1.9 Community Development Trends and Future Vulnerability

Controlling floodplain development is the key to reducing flood-related damages. Areas with recent development within the county may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible. Damage to these can cause the backup of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

Another key strategy in natural hazard mitigation is the conversion of frequently-flooded land to wetlands. Wetlands promote human well-being in many ways including improvements to water purification, increased water supply, climate regulation, flood regulation, and opportunities for recreation and tourism. According to a report by the US EPA, a one-acre wetland can store approximately three-acre feet of water, which is equal to one million gallons. Furthermore, trees and other wetland vegetation slow the speed of flood waters, ultimately lowering flood heights and naturally mitigating potential flood-related destruction.

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

4.3.1.10 Relationship to other Hazards

Severe storms and blizzards - Summer storms lead to logjams, and snowmelt can contribute to flooding and, under the right circumstances, flash flooding.

Dam Failure - Flood events can compromise the structural integrity of dams.

Public Health - Public health can be affected as a result of wastewater spills due to flooding or power failures.

Water Main Breaks - Surges in water pressure as a result of water pumps starting after power outages can lead to water main breaks.

4.3.2 Earthquake

4.3.2.1 Hazard Definition for Earthquake

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake. Ninety-five percent of earthquakes occur at the plate boundaries; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern US.

Ground shaking and tremors from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and communication (e.g. phone, cable, Internet) services; and sometimes trigger landslides, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil and trailers or homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Magnitude, which is determined from measurements on seismographs, measures the energy released at the source of the earthquake. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects on people, human structures, and the natural environment. Table 19 and Table 20 list earthquake magnitudes and their corresponding intensities.

Table 19. Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 20. Earthquake Magnitude vs. Modified Mercalli Intensity Scale

Earthquake Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher

4.3.2.2 Earthquake History in Washington County

The most seismically active area in the Central US is referred to as the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the central US capable of producing damaging earthquakes. The Wabash Valley Fault System in Indiana shows evidence of large earthquakes in its geologic history, and there may be other currently unidentified faults that could produce strong earthquakes.

At least 43 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event in Indiana was a M3.1 centered just north of Vincennes on May 10, 2010. A M3.8 earthquake occurred near Kokomo in December later that same year with approximately 10,390 individuals submitting felt reports to the USGS.

The majority of seismic activity in Indiana occurs in the southwestern region of the state. Earthquakes originate just across the boundary in Illinois and can be felt in Indiana.

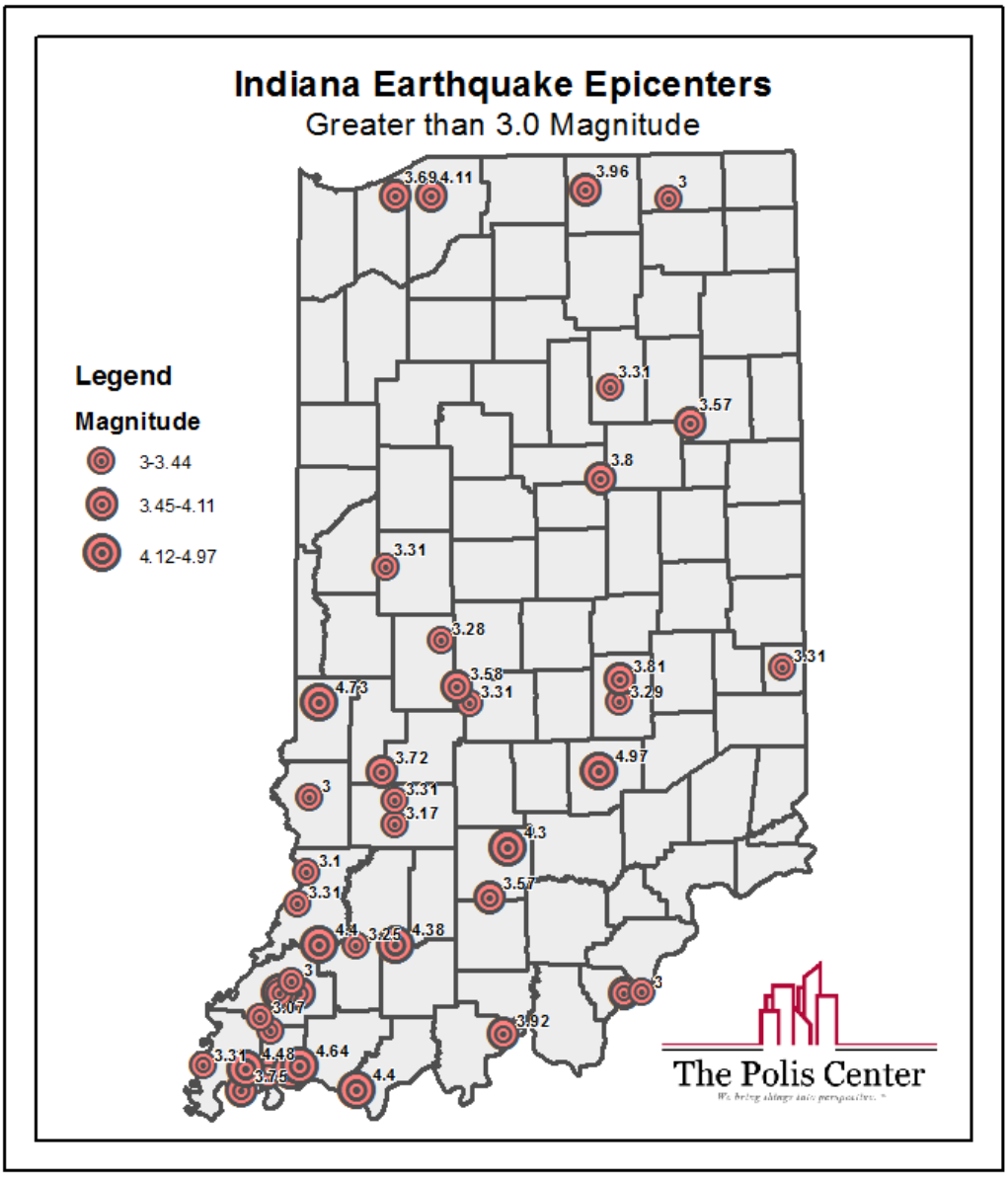

Figure 25. Indiana Earthquake Epicenters Map

4.3.2.3 Geographic Location for Earthquake

Washington County occupies a region susceptible to two earthquake threats: the threat of an earthquake along the Wabash Valley Fault System and the threat of an event near Anna in Shelby County Ohio. Return periods for large earthquakes within the New Madrid System are estimated to be 500 years. Moderate quakes between magnitude 5.5 and 6.0 can recur within approximately 150 years or less. The Wabash Valley Fault System is a sleeper that threatens the southwest quadrant of the state and may generate an earthquake large enough to cause damage as far north and east as Central Michigan.

4.3.2.4 Hazard Extent for Earthquake

The extent of the earthquake is countywide. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. A National Earthquake Hazards Reduction Program (NEHRP) compliant soils map was used for the analysis which was provided by IGS. The map identifies the soils most susceptible to failure and ranks their liquefaction potential. Washington County is primarily made up of soils ranking as low potential for liquefaction, however the northern border has a high probability ranking.

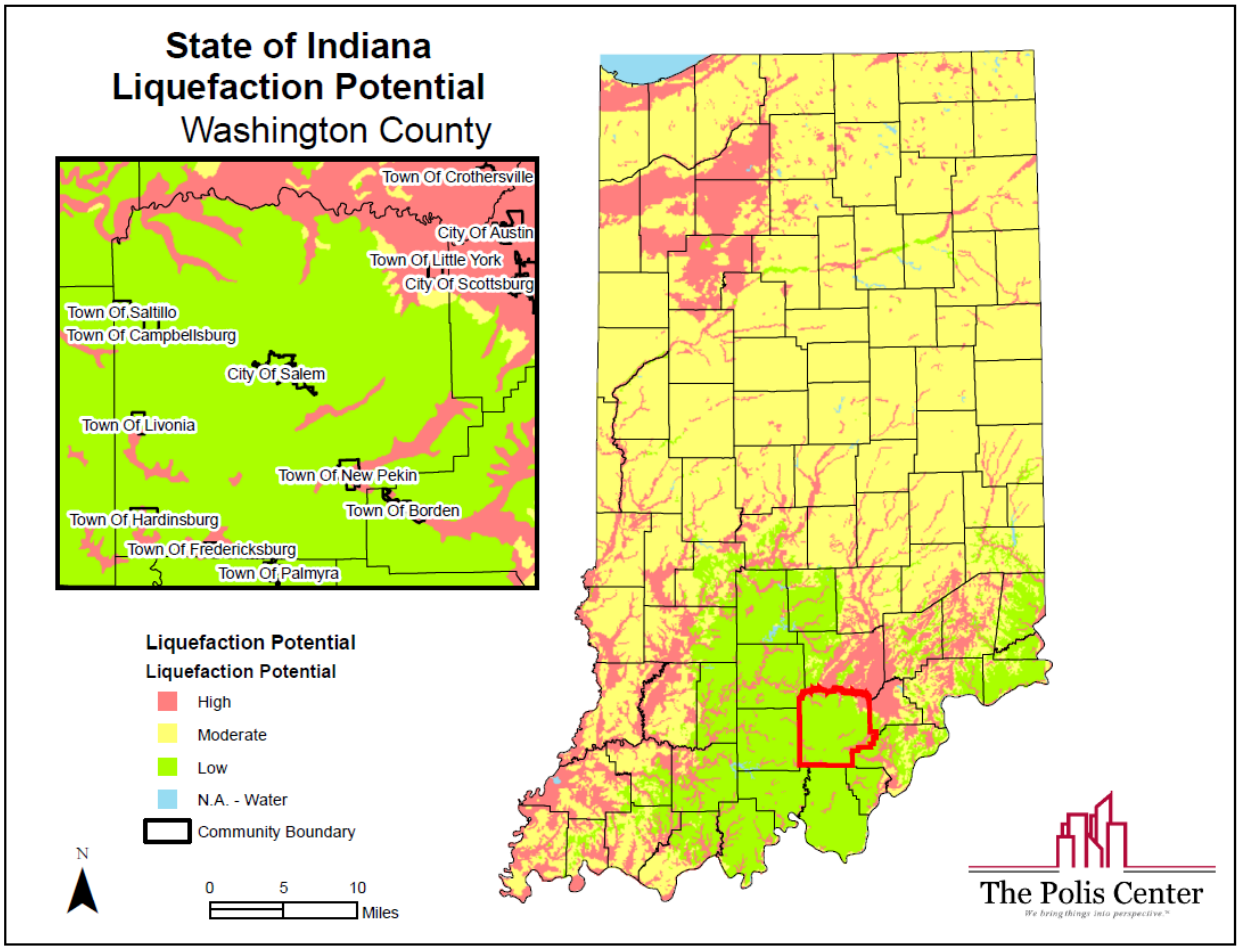

Figure 26. NEHRP State of Indiana Liquefaction Potential

4.3.2.5 Risk Identification for Earthquake

In Meeting #2, the planning team determined that the probability of an earthquake as possible with negligible results. Earthquakes were determined to have a warning time of less than six hours with a duration more than 1 week. The calculated CPRI for earthquakes in Washington County is 2.2.

4.3.2.6 Vulnerability Analysis for Earthquake

During an earthquake, the types of infrastructure that could be impacted include roadways, runways, utility lines and pipes, railroads, and bridges. Because an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that any number of these structures could become damaged in the event of an earthquake. The impacts to these structures include broken, failed, or impassable roadways and runways; broken or failed utility lines, such as loss of power or gas to a community; and railway failure from broken or impassable tracks. Bridges also could fail or become impassable, causing traffic risks, and ports could be damaged, which would limit the shipment of goods. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of numbers and types of buildings and infrastructure.

Hazus-MH for Earthquake Analysis model estimates damages and loss of buildings, lifelines, and essential facilities from Deterministic and probabilistic scenarios.

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake.

The building damage total loss amount is developed by the building inventory attributes inputs. Depending on the material of construction, type of foundation, year of construction the expense in rebuilding the expense will be affected.

Four events were modeled. The first scenario is the New Madrid Scenario. This scenario is based on the 1918 New Madrid 7.7 earthquake. The second scenario uses the Mount Carmel, IL 2010 location as the epicenter and a magnitude of 6.8. This location is part of the Wabash Valley Fault System. The model uses Liquefaction and Soils data maps in order to account for the local soil conditions for estimating ground motion and liquefaction.

Additionally, the analyses included two different types of probabilistic scenarios. These types of scenarios are based on ground shaking parameters derived from U.S. Geological Survey probabilistic seismic hazard curves. The first probabilistic scenario was a 500-year return period scenario. This evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude that would be typical of that expected for a 500-year return period. The second probabilistic scenario allowed calculation of annualized loss. The annualized loss analysis in Hazus-MH provides a means for averaging potential losses from future scenarios while considering their probabilities of occurrence. Hazus-MH then calculates the probabilities of these events as well as the interim events, calculates their associated losses, and sums these losses to calculate an annualized loss.

The Building Damage Summary by Earthquake Event table displays damages for all 4 scenarios run by Hazus-MH. displays building loss amounts for all 4 scenarios. In addition to the dollar

amount of losses, the table displays the number of buildings damaged and to what extent. Figure 27 displays the Earthquake Scenarios total losses for each scenario broken down by census tract.

Table 21. Building Damage Summary by Earthquake Event

Scenario	Total Loss in Millions of Dollars	Moderate	Extensive	Complete
New Madrid, KY M7.7	5.92	161	15	1
Mount Carmel, IL M6.8	11.54	274	29	3
Probabilistic	4.65	115	10	1
Annualized	0.4	-	-	-

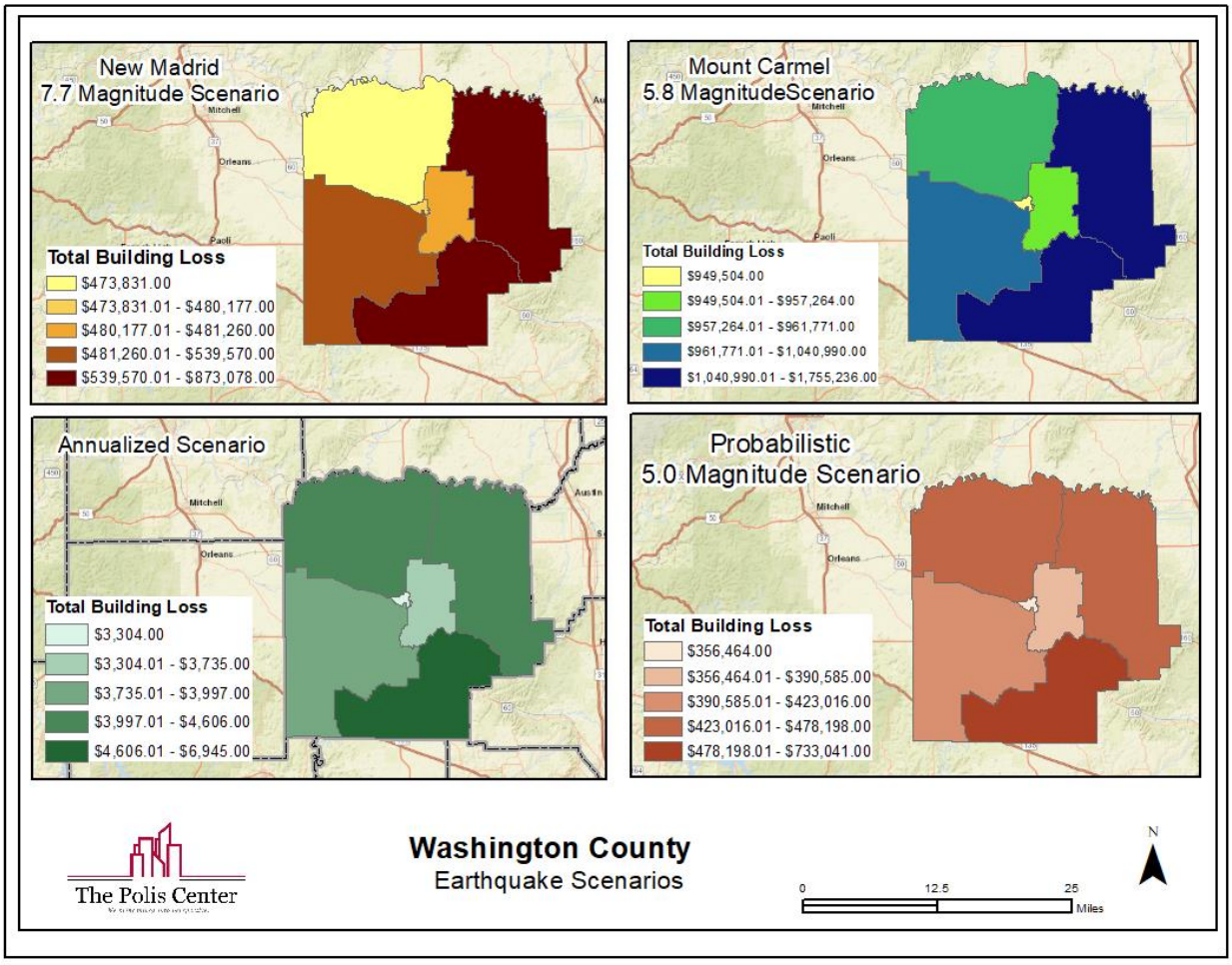

Figure 27. Earthquake Scenarios for Washington County

4.3.2.7 Community Development Trends and Future Vulnerability

Community development will occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. New construction, especially critical facilities, will accommodate earthquake mitigation design standards.

The possibility of the occurrence of a catastrophic earthquake in the central and eastern United States is real as evidenced by history and described through this section. The impacts of significant earthquakes affect large area, terminating public services and systems needed to aid the suffering and displaced. These impaired systems are interrelated in the hardest struck zones. Power lines, water and sanitary lines, and public communications may be lost; highway, railways, rivers, and ports may not allow transportation to the affected region. Furthermore, essential facilities such as fire and police departments and hospitals, may be disrupted if not previously improved to resist earthquakes.

As with hurricanes, mass relocation may be necessary, but the residents who are suffering from the earthquake can neither leave the heavily impacted areas nor receive aid or even communication in the aftermath of a significant event.

4.3.2.8 Relationship to other Hazards

Ground Failure- According to the National Academies of Sciences Engineering Medicine, the major cause of earthquake damage is ground failure. Some ground failures induced by earthquake are the result of liquefaction of saturated sands and silts, the weakening of sensitive clays, or by the crumbling and breaking away of soil and rock on steep slopes. Ground failure has been known to cause buildings to collapse and to severely hinder communication and transportation systems.

Utility Failure- Earthquakes frequently damage utilities, particularly underground facilities and older storage tanks, but nearly every utility can be vulnerable to the shaking that earthquakes induce. Seismic damage to buried utilities are often influenced by ground conditions and subsurface strain distribution. Since utilities are typically part of a larger network system, damages to key locations in a network can potentially set off a chain reaction that affects significant portions of the utility system as a whole. Earthquake damage to utilities can also potentially create secondary hazards such as fires or hazmat situations since some utilities may handle volatile or flammable substances.

4.3.3 Ground Failure

4.3.3.1 Hazard Definition for Ground Failure

Indiana has three types of ground failure. Ground failure is a general reference to landslides, fluvial erosion, and subsidence to include karst sinkholes, and underground coal mine collapse.

Landslides

Landslides are a serious geologic hazard common to almost every state in the US. It is estimated that, nationally, they cause up to $2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The term landslide is a general designation for a variety of downslope movements of earth materials. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. The main causes of landslides include:

- Significant ground vibration
- Slope failure due to excessive downward movement, gravity
- Groundwater table changes (often due to heavy rains)

Preventive and remedial measures include modifying the landscape of a slope, controlling the groundwater, constructing tie backs, spreading rock nets, etc. The expansion of urban and recreational development into hillside areas has resulted in an increasing number of properties subject to damage as a result of landslides. Landslides commonly occur in connection with other major natural disasters such as earthquakes, wildfires, and floods.

Karst

Southern Indiana has a network of underground caves formed by what is known as karst landscape. According to the Indiana Geological Survey, karst topography is a distinctive type of landscape largely shaped by the dissolving action of groundwater on carbonate bedrock, usually limestone. This geological process, which will take thousands of years, is characterized by unique features such as sinkholes, fissures, caves, disappearing streams, springs, rolling topography, and underground drainage systems. Structures built above a karst formation could potentially be subject to land subsidence and collapse into a resulting sinkhole.

Washington County Karst areas are mapped in Figure 28.

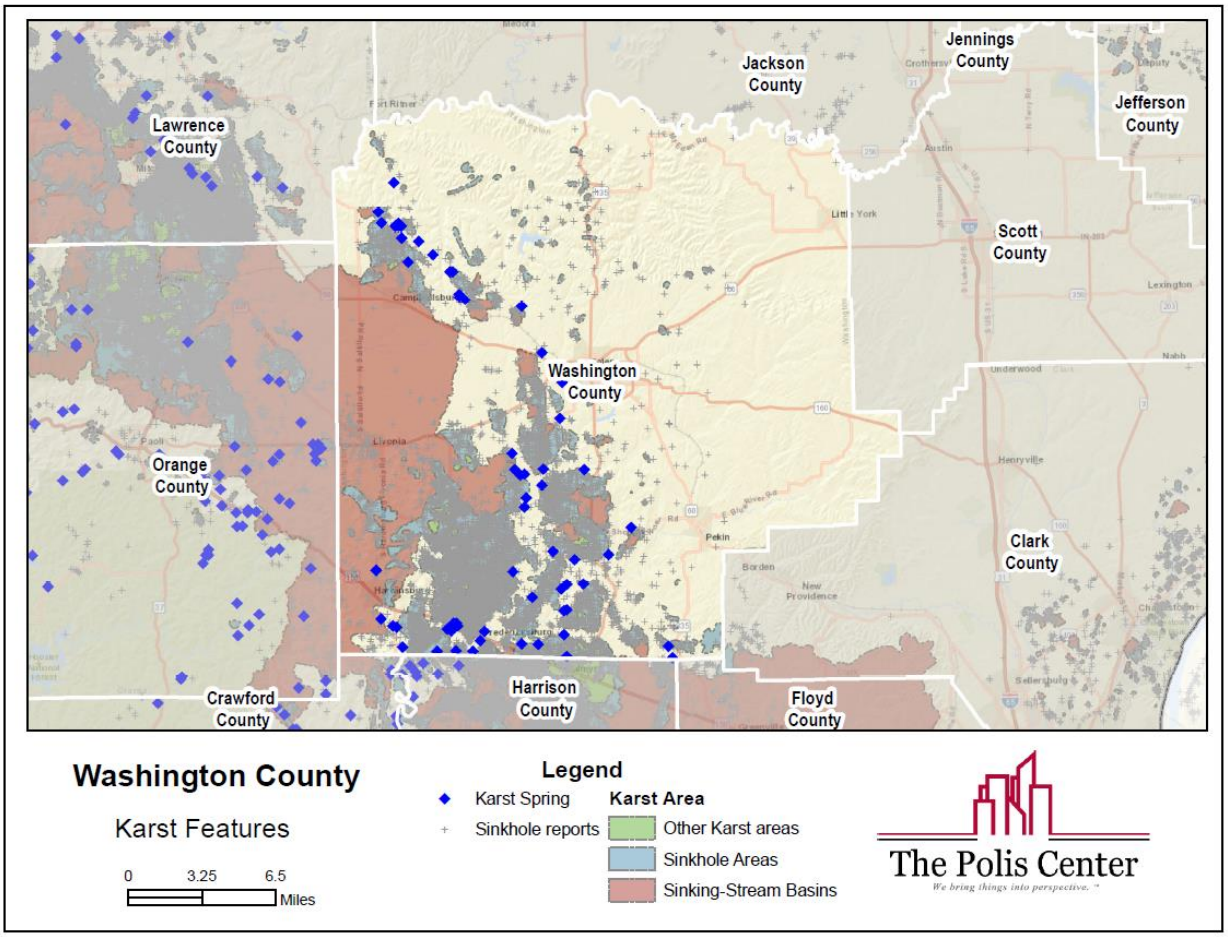

Figure 28. Washington County Karst Features

Underground Coal Mines

According to the Indiana Geological Survey's GIS Atlas, there are areas of underground coal mines which could lead to ground failure. Roof failure has always been a major concern in underground coal mining. The majority of underground mines in southwest Indiana are older mines since abandoned and thus susceptible to collapse.

Washington County has no underground coal mines.

Fluvial Erosion

Streams naturally migrate (change course and move laterally) over time, this movement is called a Fluvial Erosion Hazard (FEH). The rate and intensity of movement is dependent upon many factors including drainage area, geology, and human actions. FEH represents a significant concern in areas where human development and infrastructure, are established in close proximity to natural waterways. In mild cases, this may be seen as the gradual loss of a farm field or the undermining of a fence row when gradual channel migration consumes private land. In more severe cases, the FEH risk may threaten properties and/or structures to the degree that

they become uninhabitable or even lost to natural channel processes. Figure 29 highlights streams found to be “actively migrating” which can indicate an increased FEH risk.

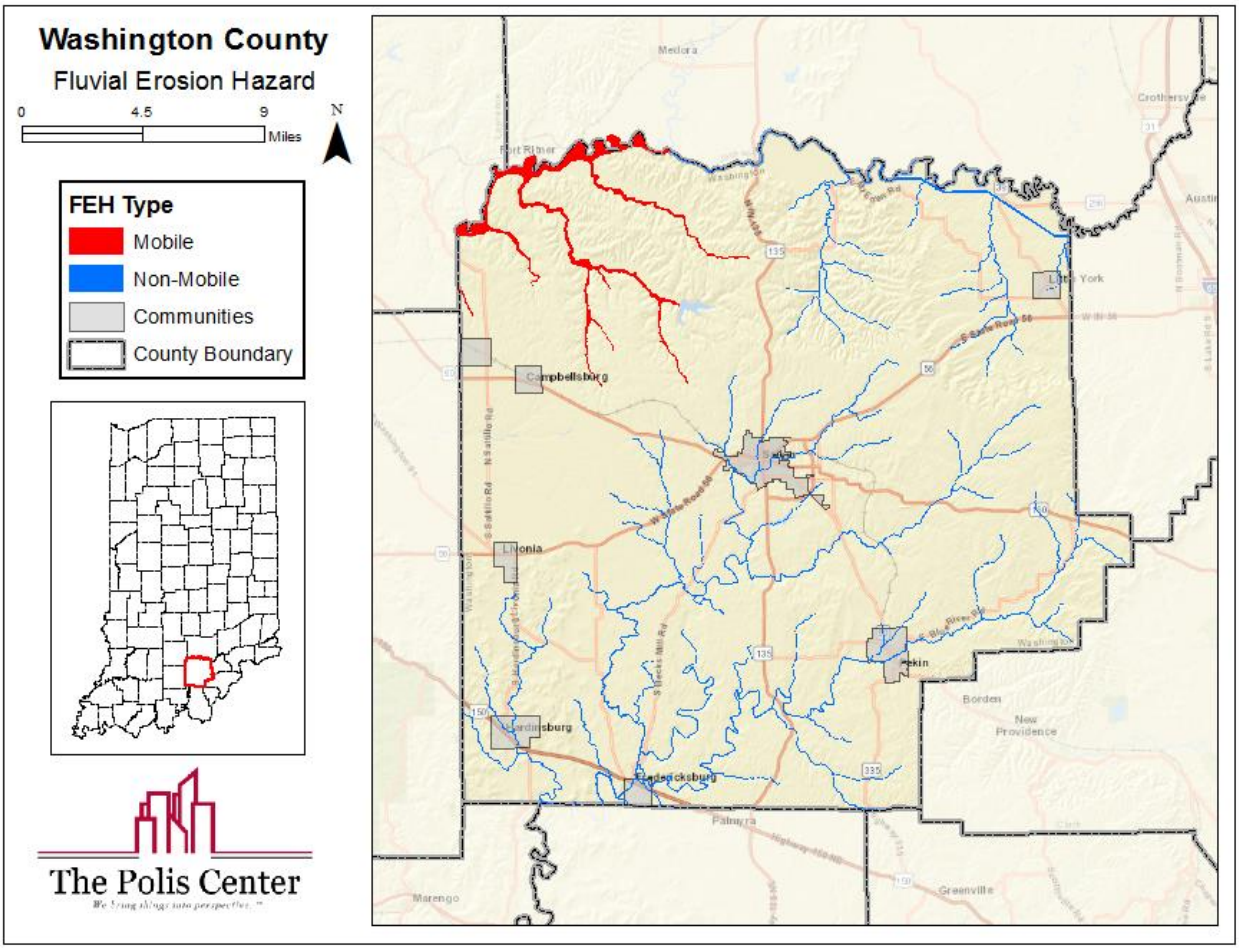

Figure 29. Washington County FEH Risk

4.3.3.2 Ground Failure History in Washington County

The planning team did not identify any major ground failure events including landslide and land subsidence events.

4.3.3.3 Geographic Location for Ground Failure

Figure 30 shows the slope analysis for Washington County. The terrain of Washington County is driven by the rivers and streams laced throughout the county. Areas of steeper slope were examined in relationship to the infrastructure and were mapped in the Vulnerability Analysis section below.

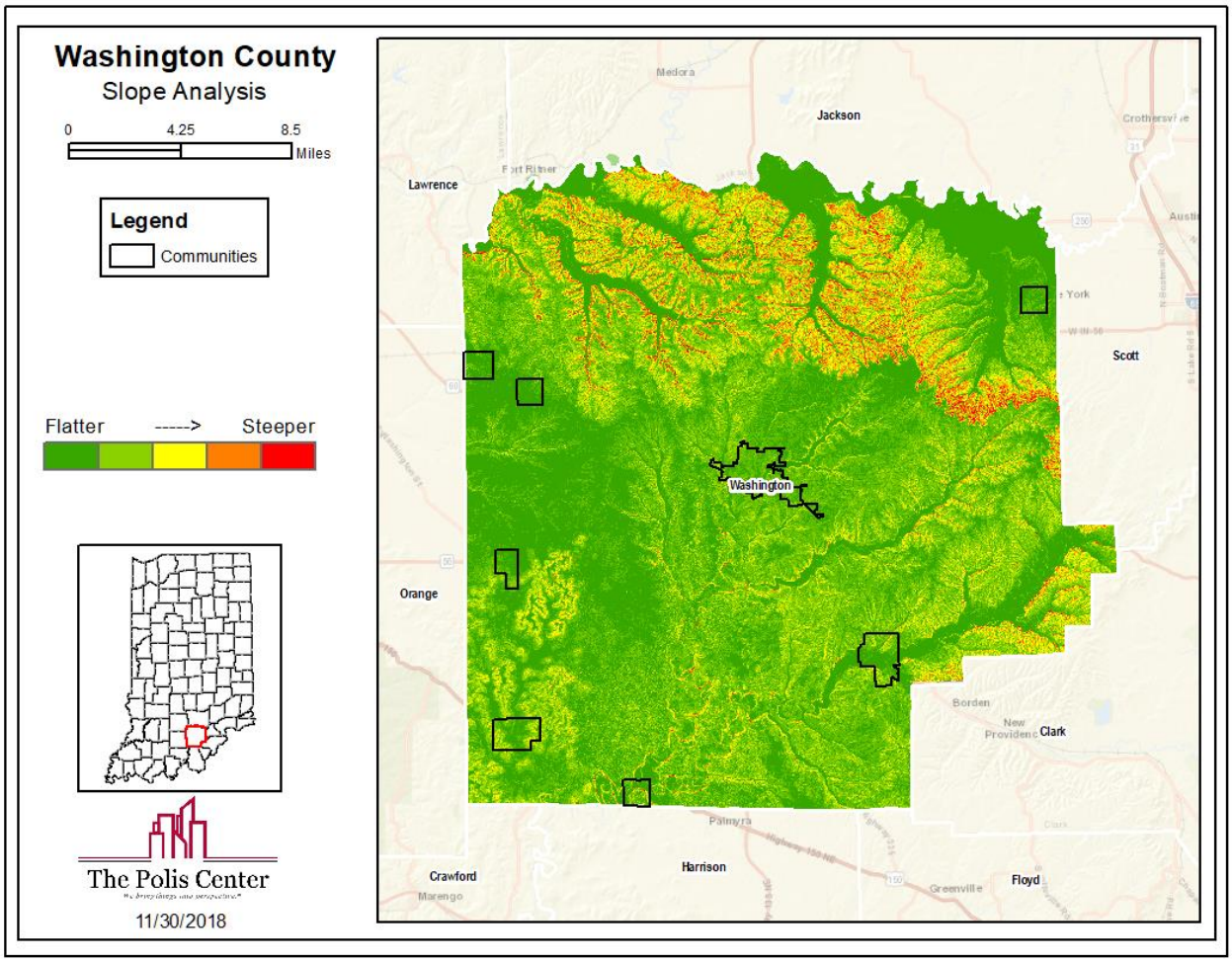

Figure 30. Washington County Slope Analysis

4.3.3.4 Hazard Extent for Ground Failure

The extent of the ground failure hazard is closely related to development near the regions that are at risk. The extent will vary within these areas depending on the potential of elevation change, as well as the size of the underground structure. The hazard extent of ground failure is related to various concentrated areas as shown on the maps.

4.3.3.5 Risk Identification for Ground Failure

In Meeting #2, the planning team determined that the probability of ground failure is unlikely with negligible consequences. The warning time for ground failure is less than 6 hours with a duration of more than 1 week. The calculated CPRI for ground failure is 1.75.

4.3.3.6 Vulnerability Analysis for Ground Failure

The terrain of Washington County is largely smooth except for slopes around rivers or creeks. The existing essential facilities of Washington County are not subjected to any major slope failure but have been mapped for reference in Figure 31 & Figure 32.

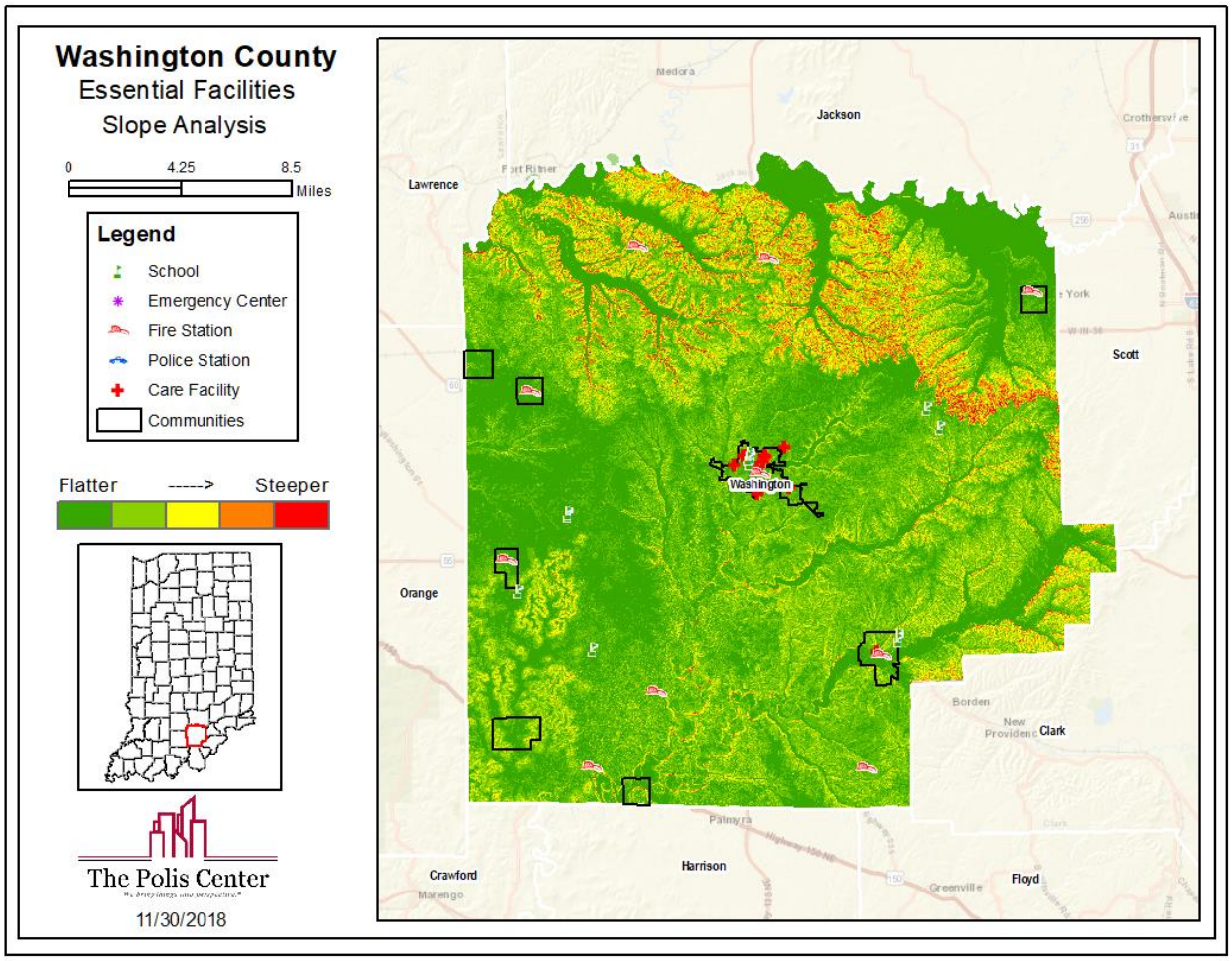

Figure 31. Slope Map-Washington County Zoomed

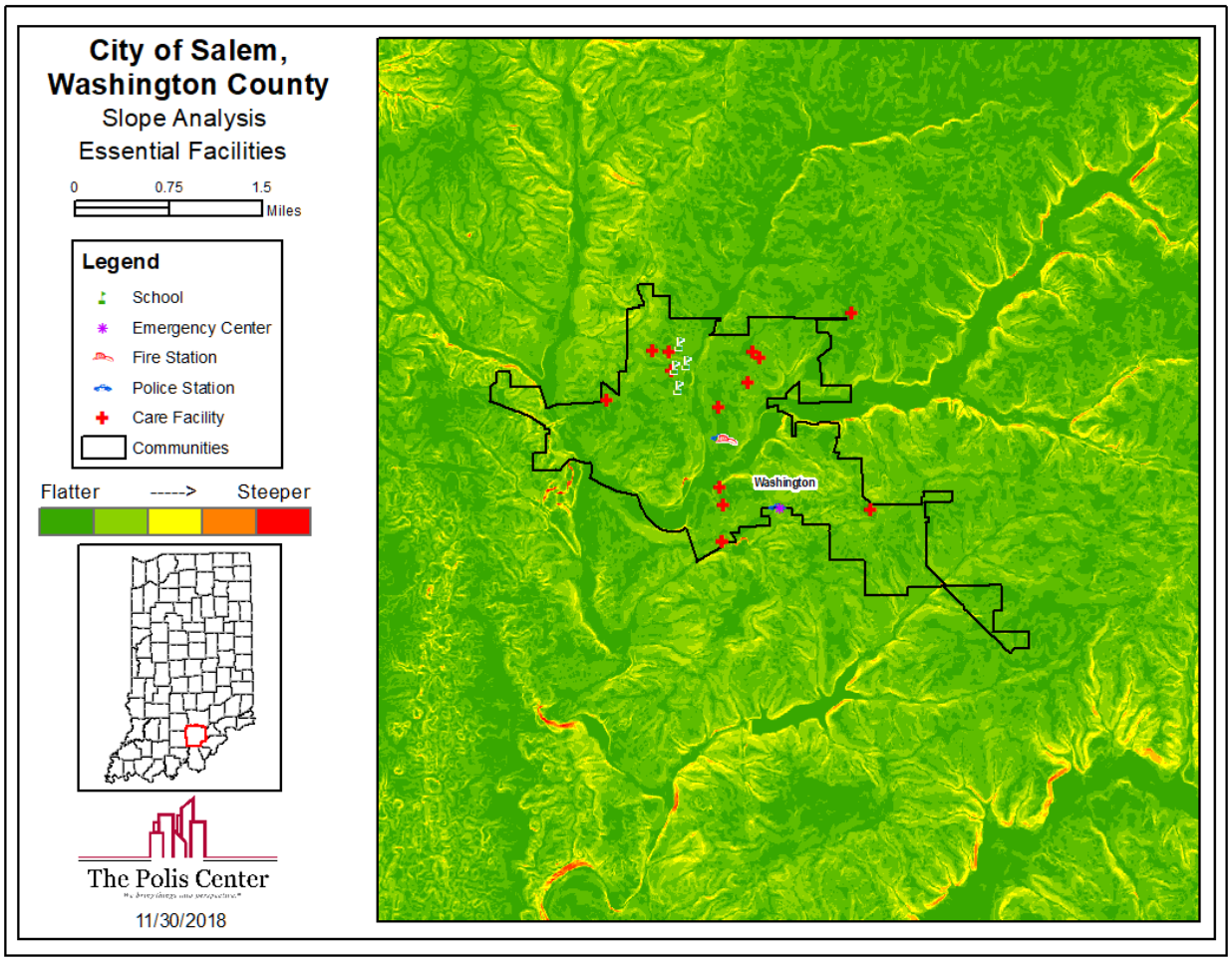

Figure 32. City of Salem, Ground Failure

The US Geological Survey's Landslide Overview Map of the Conterminous United States shows two large zones in south-central Indiana as having moderate susceptibility for landslides, but with low incidence of landslides. In contrast, the majority of northern Indiana has a very low (less than 1.5% of the area involved) incidence of landslides and only the northwest is shown as having a moderate level of susceptibility. Areas in the southwest and to the east are more likely to fail because of a landslide.

As seen in USGS Landslide Overview Map figure, Washington County predominantly lies in the low landslide incidence zone.

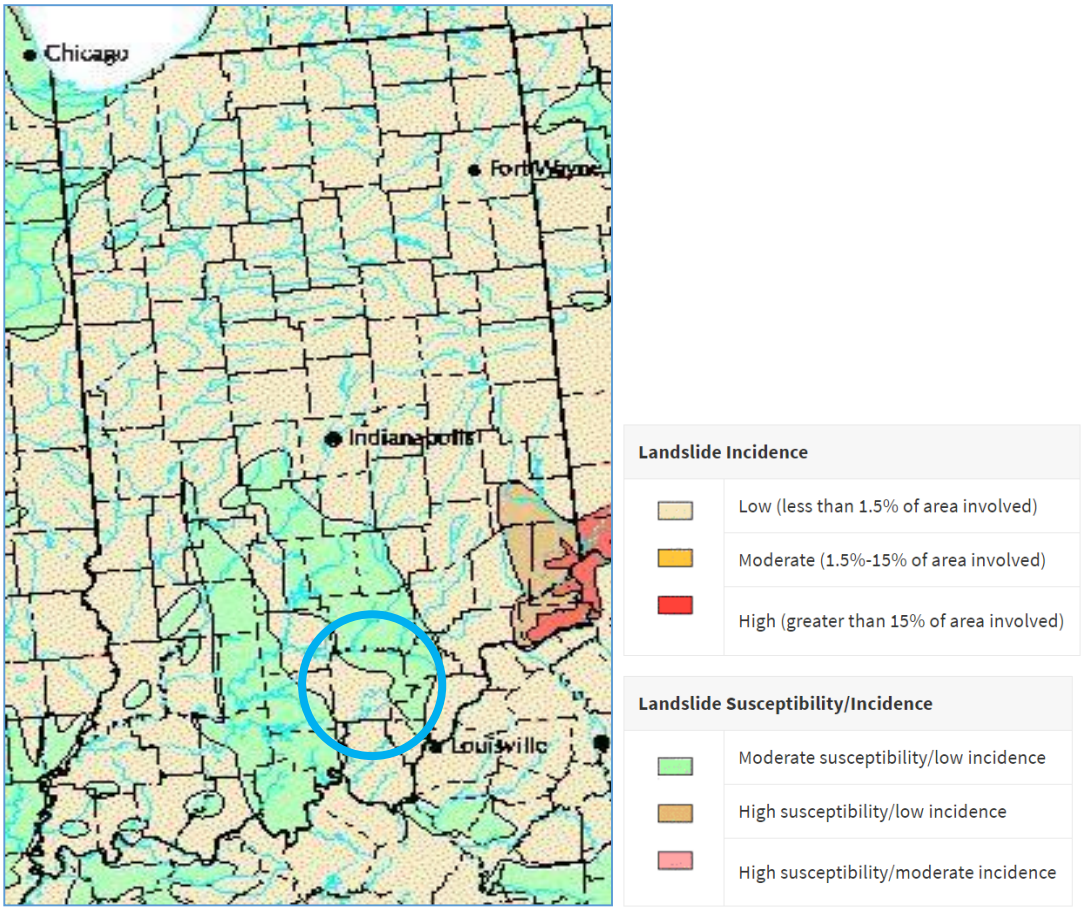

Figure 33. USGS Landslide Overview Map

4.3.3.7 Community Development and Future Vulnerability

All future communities, buildings, and infrastructure will remain vulnerable to ground failure in the areas of Washington County where underground mine features exist, where the structures are located near streams and rivers, and in areas of significant elevation change. In areas with higher levels of population, the vulnerability is greater than in open areas with no infrastructure demands. Abandoned underground mine subsidence may affect several locations within the county; therefore, buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Currently, Washington County reviews new developments for compliance with the local zoning ordinance. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

4.3.3.8 Relationship to other Hazards

Flooding – Flooding is typically the leading cause to ground failure, particularly along streams. Ground failure and flooding combine to impact property and infrastructure such as roads and bridges.

4.3.4 Summer Storms and Tornadoes

4.3.4.1 Hazard Definition for Summer Storm

Thunderstorms

Severe thunderstorms are defined as thunderstorms with one or more of the following characteristics: strong winds, large damaging hail, or frequent lightning. Severe thunderstorms most frequently occur in Indiana during the spring and summer but can occur any month of the year at any time of day. A severe thunderstorm's impacts can be localized or widespread in nature. The National Oceanic and Atmospheric Administration's National Weather Service classifies a thunderstorm as severe when it meets one or more of the following criteria:

- Hail with a one-inch diameter or higher
- Wind speeds equal to or greater than 58 miles an hour
- Thunderstorms that produce a tornado

The National Weather Service does not consider lightning frequency a criterion for issuing a severe thunderstorm warning; however, frequent and dangerous lightning is considered a severe weather hazard. The NOAA consistently ranks lightning as one the top weather killers in the United States.

Lightning

Lightning is caused by the discharge of electricity between clouds or between clouds and the surface of the earth. In a thunderstorm there is a rapid gathering of particles of moisture into clouds and forming of large drops of rain. This gathers electric potential until the surface of the cloud (or the enlarged water particles) is insufficient to carry the charge, and a discharge takes place, producing a brilliant flash of light. The power of the electrical charge and intense heat associated with lightning can electrocute on contact, split trees, ignite fires, and cause electrical failures. Most lightning casualties occur in the summer months, during the afternoon and early evening.

Hail

Hail is a product of a severe thunderstorm. Hail consists of layered ice particles which are developed when strong updrafts within the storm carry water droplets above the freezing level. They remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. The NWS uses the following descriptions when estimating hail sizes: pea size is ¼ inch, marble size is ½ inch, dime size is ¾ inch, quarter size is 1 inch, golf ball size is 1 ¾ inches, and baseball size is 2 ¾ inches. Individuals who serve as volunteer "storm spotters" for the NWS are located throughout the state, and are instructed to report hail dime size (¾ inch) or greater. Hailstorms can occur throughout the year; however, the months of maximum hailstorm frequency are typically between May and August. Although hailstorms rarely cause injury or loss of life, they can cause significant damage to property, particularly roofs and vehicles.

Windstorms

Windstorms can and do occur in all months of the year; however, the most severe windstorms usually occur during severe thunderstorms in the warm months. Associated with strong thunderstorms, downbursts are severe localized downdrafts from a thunderstorm or rain shower. This outflow of cool or colder air can create damaging winds at or near the surface. Downburst winds can potentially cause as much damage as a small tornado and are often confused with tornadoes due to the extensive damage that they inflict. As these downburst winds spread out, they are frequently referred to as straight-line winds. Straight-line winds can cause major structural and tree damage over a relatively large area.

Summer storms, including thunderstorms, hailstorms, and windstorms affect Washington County on an annual basis. Thunderstorms are the most common summer hazardous event in the county, occurring primarily during the months of May through August, with the severest storms most likely to occur from mid-May through mid-July. Typically, thunderstorms are locally produced by cumulonimbus clouds, are always attended by lightning, and are often accompanied by strong wind gusts, heavy rain, and sometimes hail and tornadoes.

4.3.4.2 Hazard Definition for Tornado

The Glossary of Meteorology defines a tornado as a violently rotating column of air with wind speeds between 40-300 mph, in contact with the ground, either pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud. They develop under three scenarios: (1) along a squall line; (2) in connection with thunderstorm squall lines during hot, humid weather; and (3) in the outer portion of a tropical cyclone. Funnel clouds are rotating columns of air not in contact with the ground; however, the column of air can reach the ground very quickly and become a tornado.

Since 2007, tornado strength in the United States is ranked based on the Enhanced Fujita scale (EF scale), replacing the Fujita scale introduced in 1971. The EF scale uses similar principles to the Fujita scale, with six categories from 0-5, based on wind estimates and damage caused by the tornado. The EF Scale is used extensively by the NWS in investigating tornadoes (all tornadoes are now assigned an EF Scale number), and by engineers in correlating damage to buildings and techniques with different wind speeds caused by tornadoes.

Tornado damage curves for the Fujita Scale are shown in the following table. The approximate width of the damage and minimum percent damage provide a better understanding of the capabilities of the tornado funnels as the sizes increase.

Table 22. Tornado Path Widths and Damage

Enhanced Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	3,000	100%
EF4	2,400	100%
EF3	1,800	80%
EF2	1,200	50%
EF1	600	10%
EF0	300	0%

4.3.4.3 Summer Storm and Tornado History in Washington County

Summer Storm

The history of summer storms in Washington County was determined by analyzing the hail, high wind, lightning, strong wind, and thunderstorm wind events for the county in the NCDC database. From 1966 to 2013 there were 138 summer storm-related reports. Since 2013 there have been 25 summer storm-related reports, not including reports of tornados. None of these events had any reported injuries or deaths, but did result in property damage costs. In July of 2014 lighting struck a church in Harristown, just east of Salem, and started a fire. The damage was contained to just a portion of the building, however water and smoke damage was extensive. The estimated property damage was $100,000.

A thunderstorm wind event occurred in Pekin in March of 2017 resulting in an estimated $150,000 in property damage. The National Weather Service Survey team reported intermittent pockets of straight line winds occurred along a 1 to 2-mile-wide path that started 9 miles south of Salem and extended east into Clark County. On Highway 135 south of Salem a roof was removed from a house. The storm caused sporadic tree and barn damage in many locations, the worst being along Voyles Road 3 miles south of New Pekin. In downtown Pekin a roof was removed from an abandoned building and a mobile home was flipped. Peak wind speeds were estimate to be between 60 and 90 mph. Additional NCDC events and details about their associated impacts can be found in Appendix C. Figure 34 displays the locations for historic hail and wind events in the county.

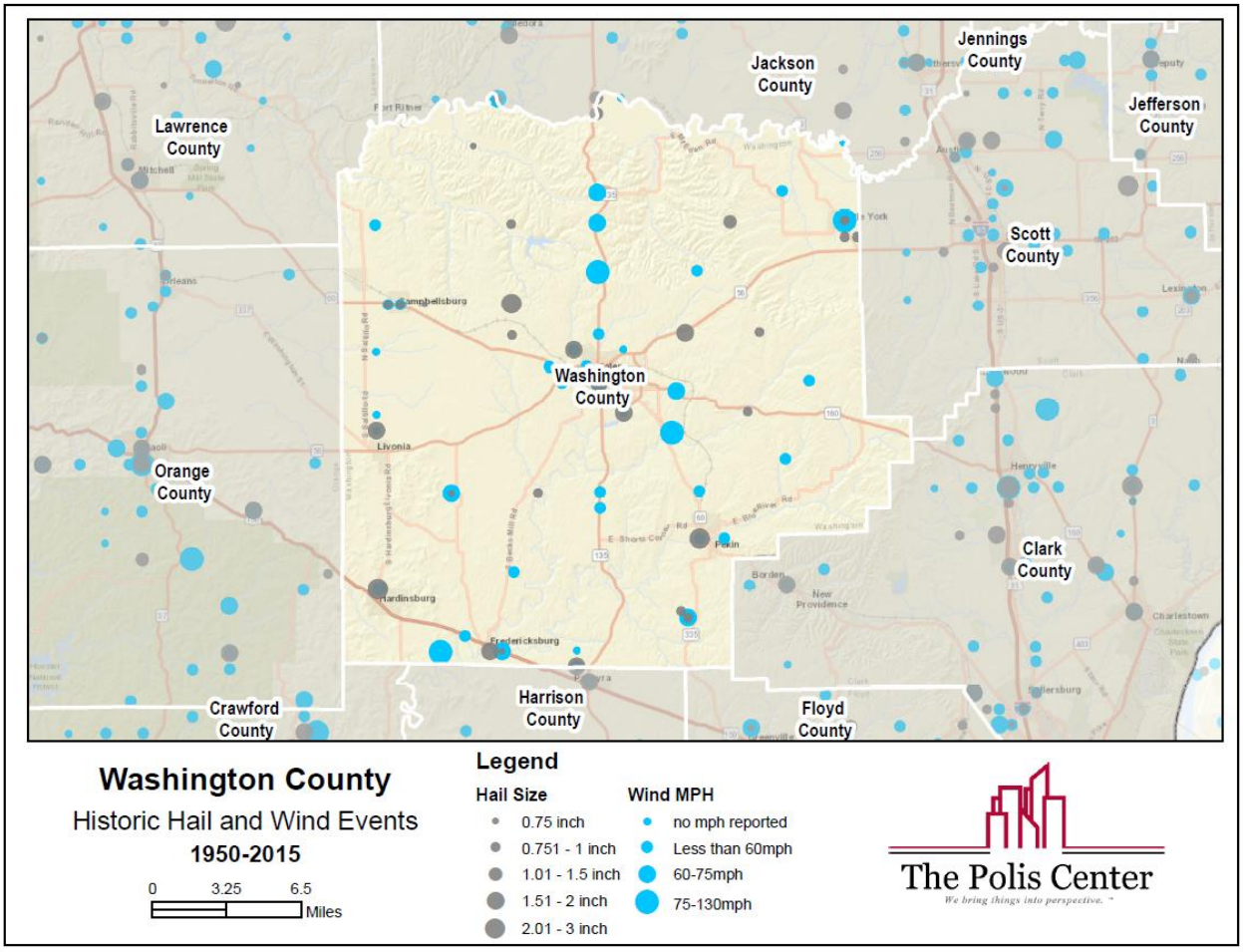

Figure 34. Washington County Historic Hail and Wind Events

Tornado

According to the NCDC there have been 19 occurrences of tornadoes within Washington County from 1967 to 2013. Since 2013 there have only been 4 occurrences in Washington County, all occurring in 2017. In March 2017, a tornado touched down in three different locations causing a total of $550,000 in property damage. The first touchdown occurred in Rosebud, an unincorporated community in Howard Township, along a forested area which threw branches and large portions of maple and cedar trees over the road approximately 300 yards. Most of the damage was concentrated at 1630 SW Washington School Road where trees were uprooted, there was some damage to gutters and roof as well as the barn. A trampoline was thrown approximately a mile from the house, playground toys were thrown several hundred yards. The estimated damage caused by the first touchdown was $100,000. The peak wind speed was estimated at 80 mph.

The second touchdown occurred in downtown Salem at the Salem Feed Mill on South Water Street. There was significant damage on the upper portion of the feed mill approximately 70 feet off the ground, along with power poles being severely bent. The tornado then hit a multi-

business building removing a large portion of the roof and dropping it on the Dinner Bell Restaurant, causing extensive damage from falling brick. Before lifting off, the tornado hit a house on the corner of Cherry and South High Street resulting in roof and siding damage. The peak wind speed at this location was estimated to be about 90 to 95 mph with a width of approximately 30 to 40 yards. Property damages were estimated at $250,000.

The third location hit by the tornado was in Canton, an unincorporated community in Washington Township. The tornado touched down near the intersection of Canton Road and Howell Road causing severe damage to several barns, street signs, bird houses and metal poles were bent or snapped. A 500-gallon propane tank moved to the south 3 feet becoming lodged against a grain storage building. The damaged was estimated at $200,000. The tornado's peak winds were approximately 90 to 95 mph with a width of 50 to 70 yards. Washington County NCDC recorded tornadoes are identified in Table 23. Additional details for NCDC events are included in Appendix C. Figure 35 displays historical tornadoes for Washington County.

*Table 23. Washington County Tornadoes**

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Washington	December 11, 1967	F1	0	0	0	25K	0
Washington	April 3, 1974	F5	0	1	12	0.00K	0
Washington	April 5, 1985	F2	0	0	0	2.5M	0
Washington	March 10, 1986	F2	0	0	0	2.5M	0
Washington	June 2, 1990	F0	0	0	0	0.00K	0
Washington	June 2, 1990	F3	0	0	0	250K	0
Washington	June 2, 1990	F2	0	0	2	250K	0
Washington	May 27, 1995	F0	0	0	0	.5K	0
Fredricksburg	January 3, 2000	F1	0	0	0	47K	
Pekin	May 27, 2004	F1	0	0	0	1.5M	
Salem	May 30, 2004	F1	0	0	0	120K	
South Boston	January 29, 2008	EF1	0	0	0	60K	50K
Little York	April 19, 2011	EF0	0	0	0		
Smedley	April 19, 2011	EF1	0	0	0		
Smedley	April 19, 2011	EF0	0	0	0		
Canton	April 19, 2011	EF0	0	0	0		
MT Carmel	May 25, 2011	EF1	0	0	0	0.00K	0.00K
MT Carmel	May 25, 2011	EF1	0	0	0	30K	0.00K
Daisy Hill	March 2, 2012	EF4	0	5	0	2M	0.00K
Rush Creek Valley	March 1, 2017	EF1	0	0	0	150K	0.0 K
Rosebud	November 5, 2017	EF0	0	0	0	100K	0.0 K
Salem	November 5, 2017	EF1	0	0	0	250K	0.0 K
Canton	November 5, 2017	EF1	0	0	0	200K	0.0 K

* NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

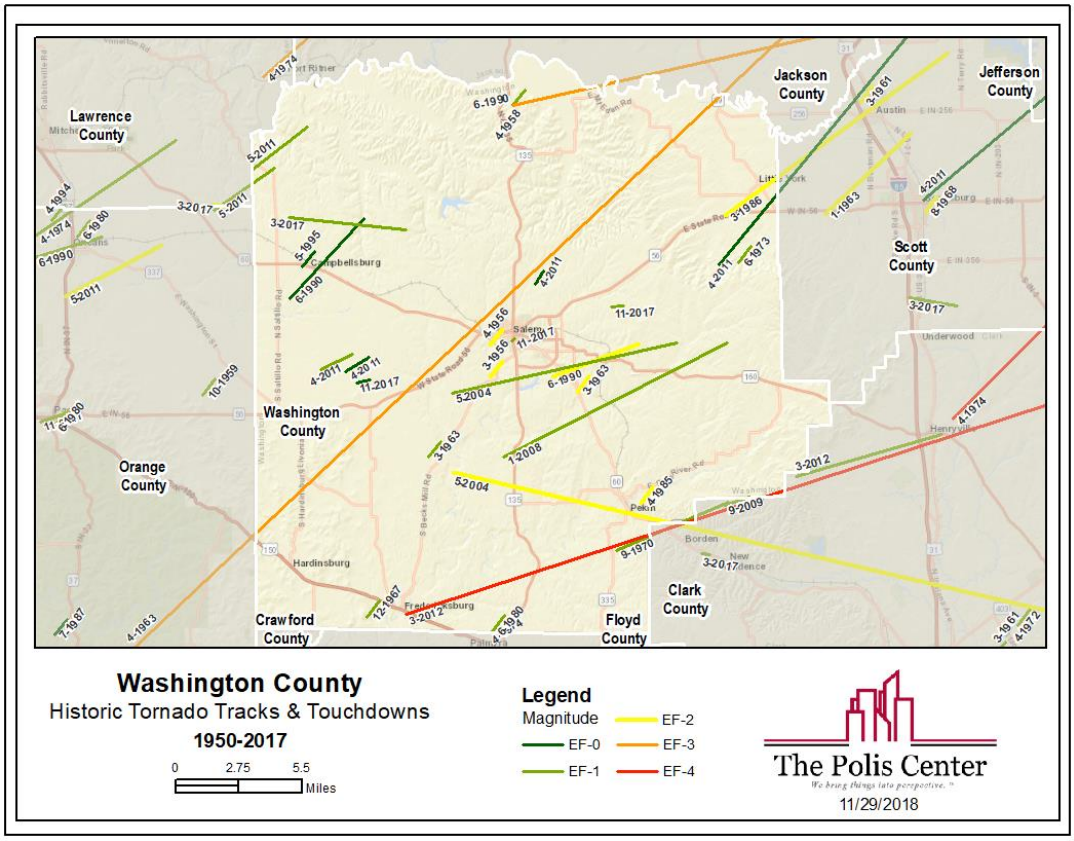

Figure 35. Historical Tornado Tracks and Touchdowns for Washington County

4.3.4.4 Geographic Location for Summer Storm and Tornado

The entire county has the same risk for occurrence of summer storms and tornadoes. They can occur at any location within the county.

4.3.4.5 Hazard Extent for Summer Storm and Tornado

The extent of the summer storm and tornado hazards vary both in terms of the extent of the path of the event and the wind speed.

4.3.4.6 Risk Identification for Summer Storm and Tornado

In Meeting #2, the planning team determined that the probability of a summer storm is highly likely with limited consequences. The warning time for a summer storm is 6 to 12 hours with a duration of less than 24 hours. The calculated CPRI for summer storm is 3.05. The planning team ranked the tornado hazard as highly likely with critical consequences. The warning time for a tornado is less than 6 hours with a duration of more than 1 week. The calculated CPRI for a tornado is 3.7.

4.3.4.7 Vulnerability Analysis for Summer Storm and Tornado

During a tornado the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a tornado. The impacts to these items include broken, failed, or impassable roadways, broken or failed utility lines (e.g. loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

All facilities are vulnerable to severe thunderstorms. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality, such as a damaged police station would no longer be able to serve the community.

During a severe thunderstorm, the types of infrastructure that could be impacted include roadways, utility lines and pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these structures could become damaged during a severe thunderstorm. The impacts to these structures include impassable roadways, broken or failed utility lines, causing loss of power or gas to the community, or railway failure from broken or impassable tracks. Additionally, bridges could fail or become impassable, causing risks to traffic.

GIS Tornado Analysis

The following analysis completed for the plan update utilizes an example scenario to gauge the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure.

GIS overlay modeling was used to determine the potential impacts of an EF-4 tornado. The analysis used a hypothetical tornado path that runs for 16 miles through the northern half of the county. This scenario includes impacts to the major employers of the county. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Figure 36 depicts tornado damage curves as well as path widths.

Table 24. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF-5	3000	100%
EF-4	2400	100%
EF-3	1800	80%
EF-2	1200	50%
EF-1	600	10%
EF-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the tornado path.

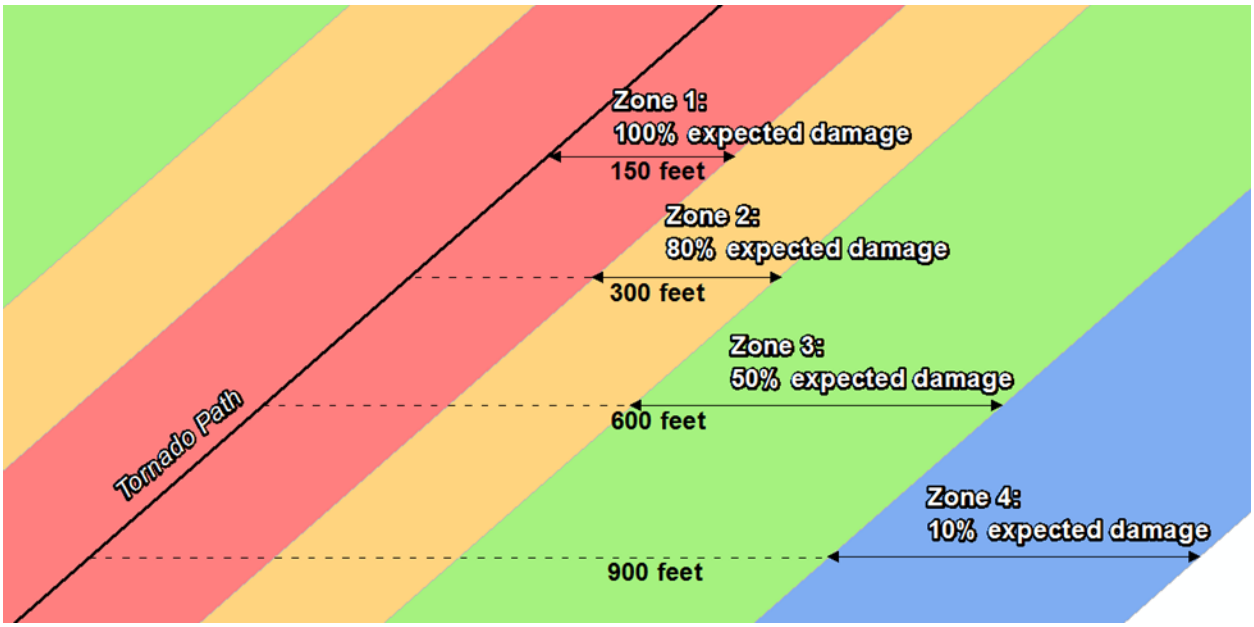

Figure 36. EF-4 Tornado Analysis, Using GIS Buffers

Table 25. EF-4 Tornado Zones and Damage Curves

Fujita Scale	Zone	Buffer (feet)	Damage Curve
EF-4	4	900-1200	10%
EF-4	3	600-900	50%
EF-4	2	300-600	80%
EF-4	1	0-300	100%

The results of the analysis are depicted in Table 26 and Table 27. The GIS analysis estimates that 932 buildings will be damaged. The estimated building losses are $387 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against the Building Inventory created at an earlier stage using the Assessor data in combination with Parcel records. NOTE: The assessor records often do not include nontaxable parcels and associated building improvements therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

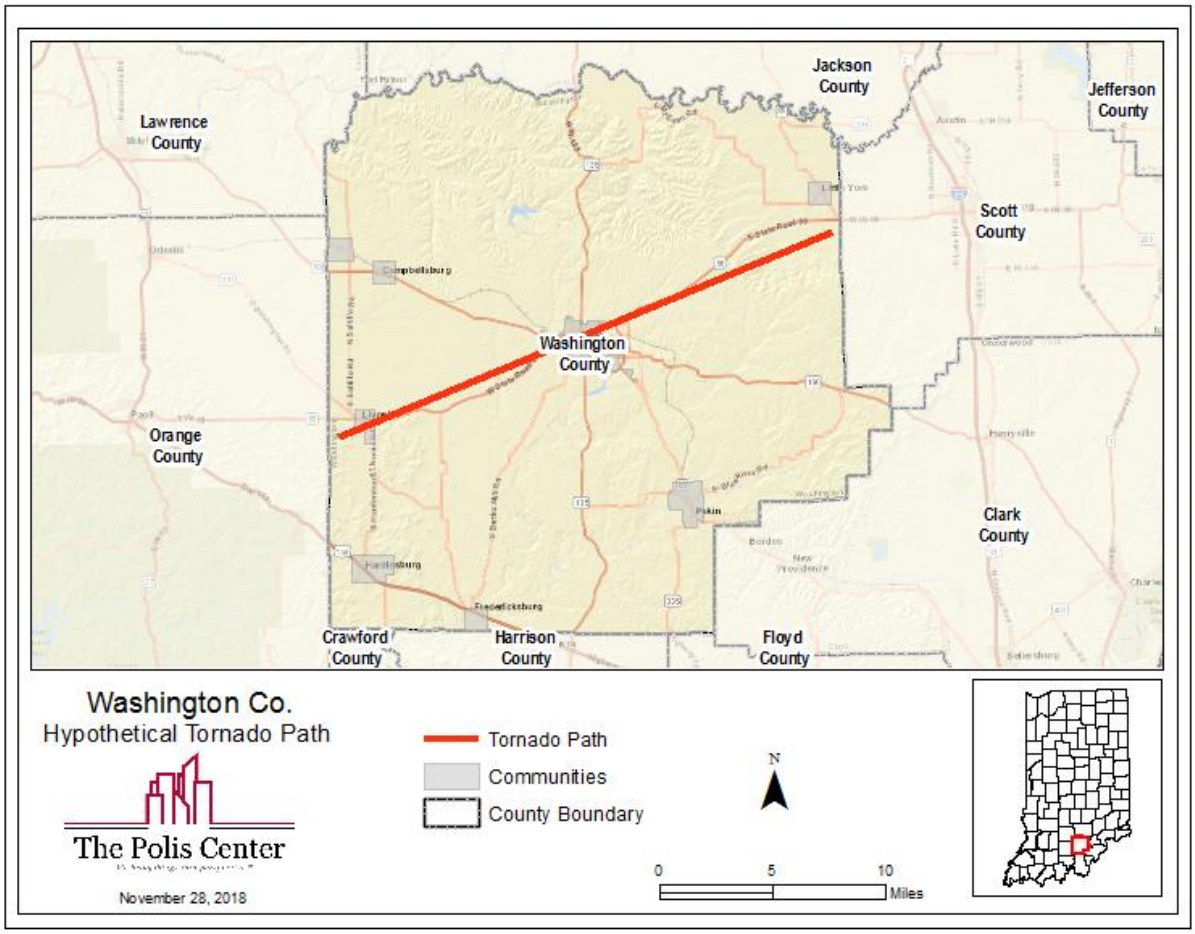

Figure 37. Modeled F4 Tornado Damage Hypothetical Path

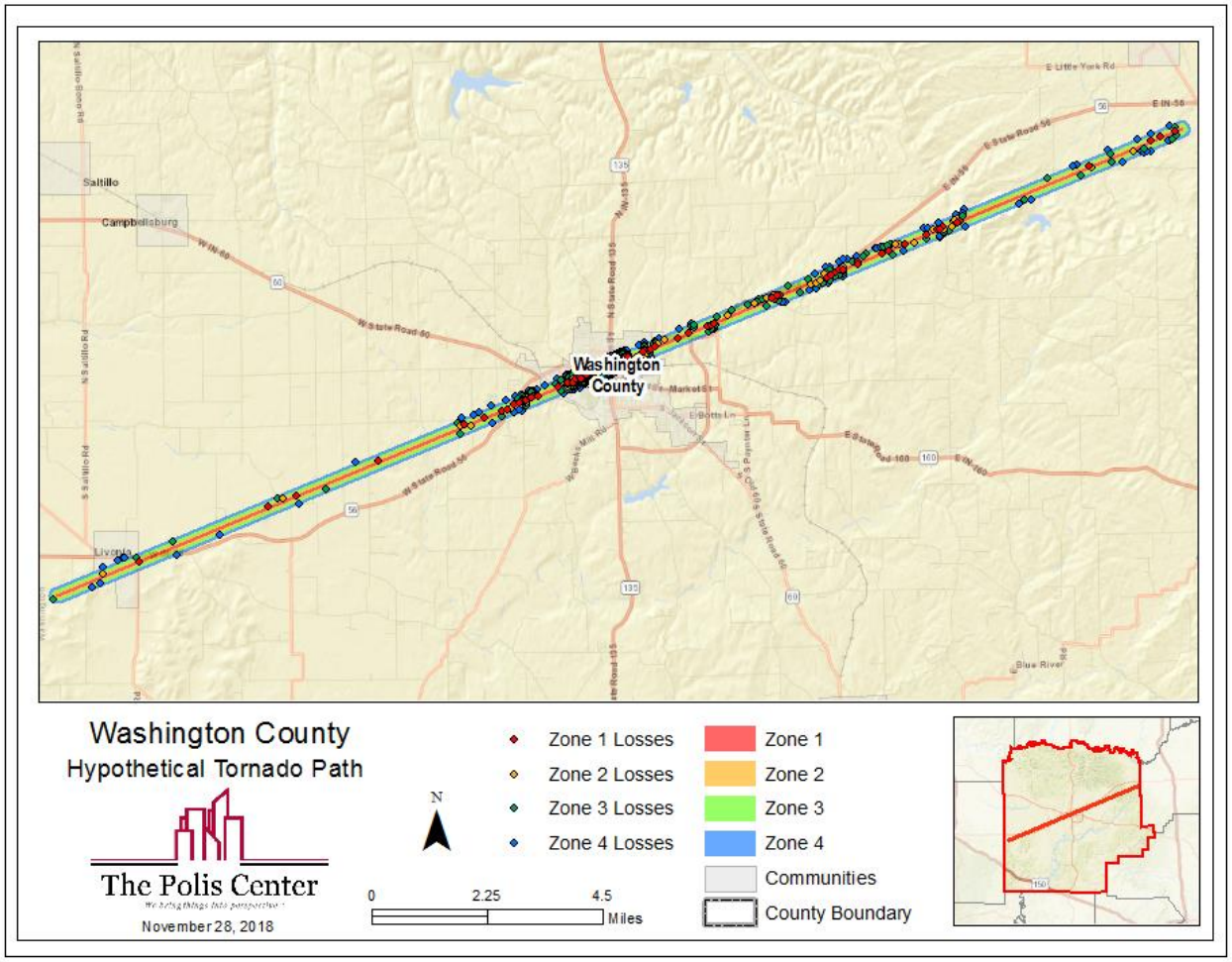

Figure 38. Tornado Path with Damaged Buildings

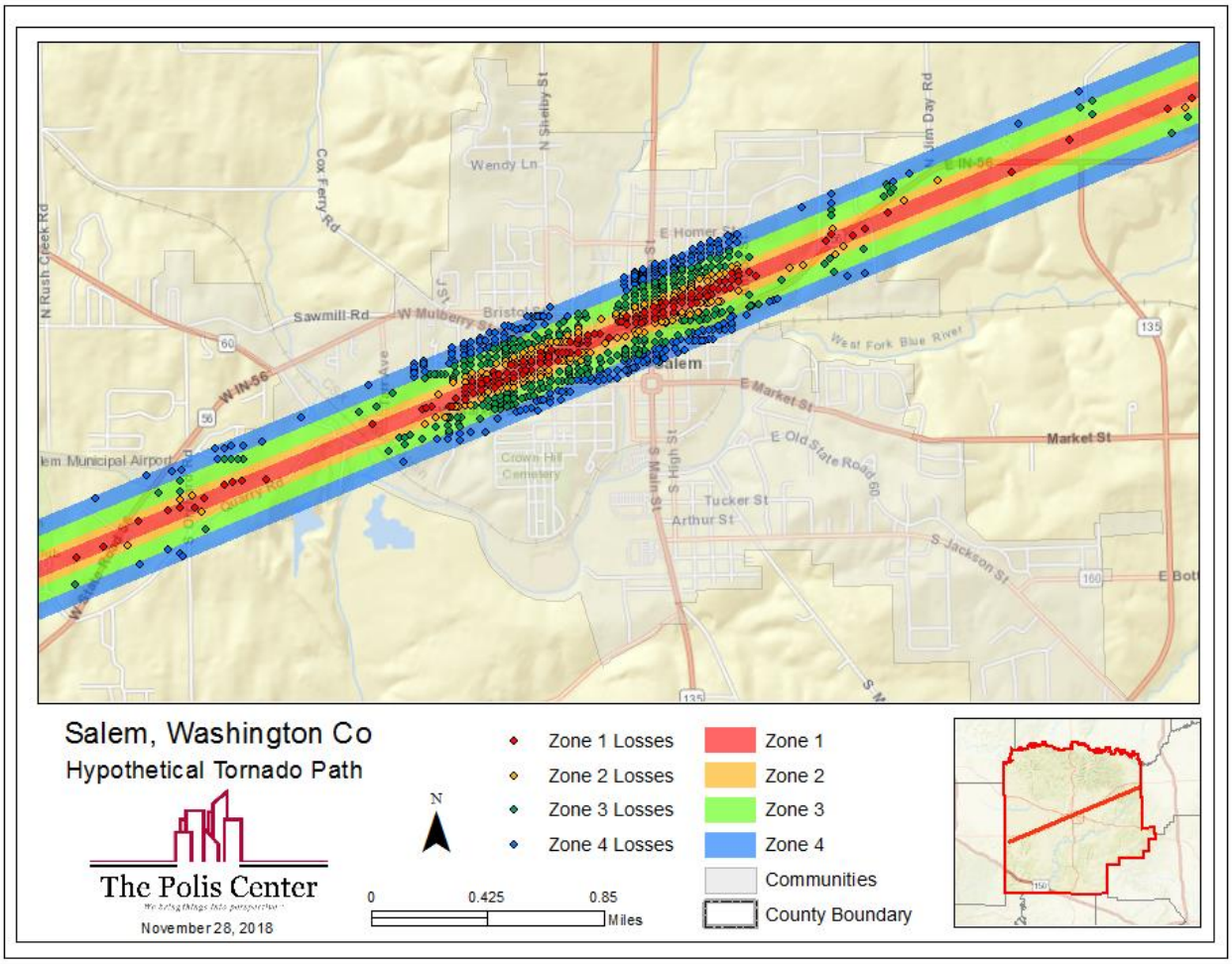

Figure 39. Tornado Path: Washington County Zoomed In

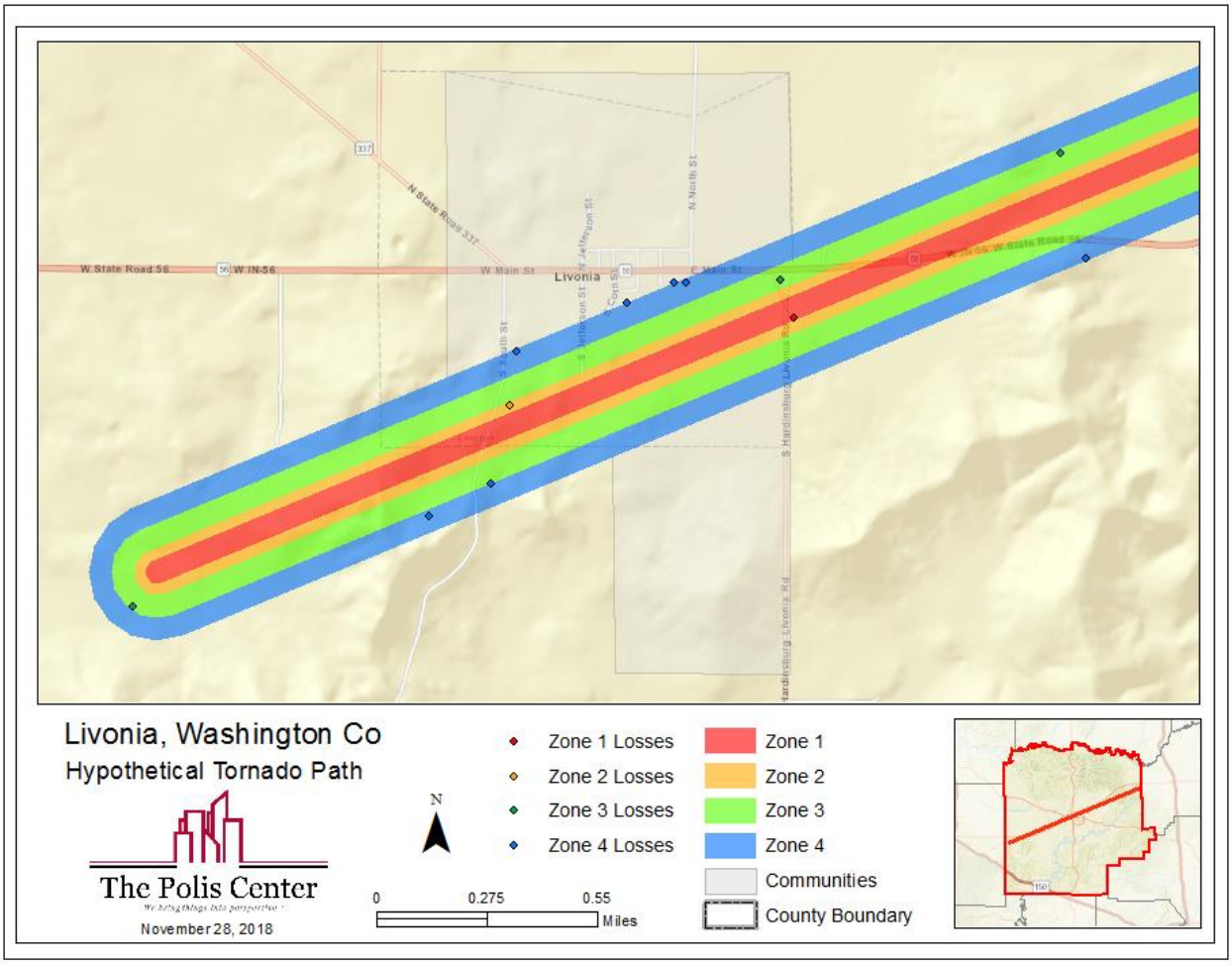

Figure 40. Tornado Path: Washington County Zoomed In

Table 26. Estimated Building Losses by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	145	140	251	240
Commercial	6	10	19	16
Industrial	1	0	3	4
Agriculture	14	10	17	18
Religious	4	0	7	9
Government	2	2	4	8
Education	0	0	0	2
Total	172	162	301	297

Table 27. Estimated Losses by Zone

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$20,941,221	$19,237,033	$34,995,181	$37,400,821
Commercial	$7,004,672	$17,234,107	$24,161,846	$48,838,784
Industrial	$943,249	$0	$9,282,292	$47,208,610
Agriculture	$3,171,255	$2,488,688	$5,622,150	$4,116,280
Religious	$1,913,547	$0	$8,689,029	$14,350,944
Government	$3,160,779	$2,798,139	$5,122,838	$13,123,980
Education	$0	$0	$0	$55,406,113
Total	$37,134,723	$41,757,967	$87,873,336	$220,445,532

Facility and Infrastructure Damage

The essential facilities damaged in the hypothetical tornado path are shown in Figure 41. Critical facilities damaged in the hypothetical path can be found in Appendix E.

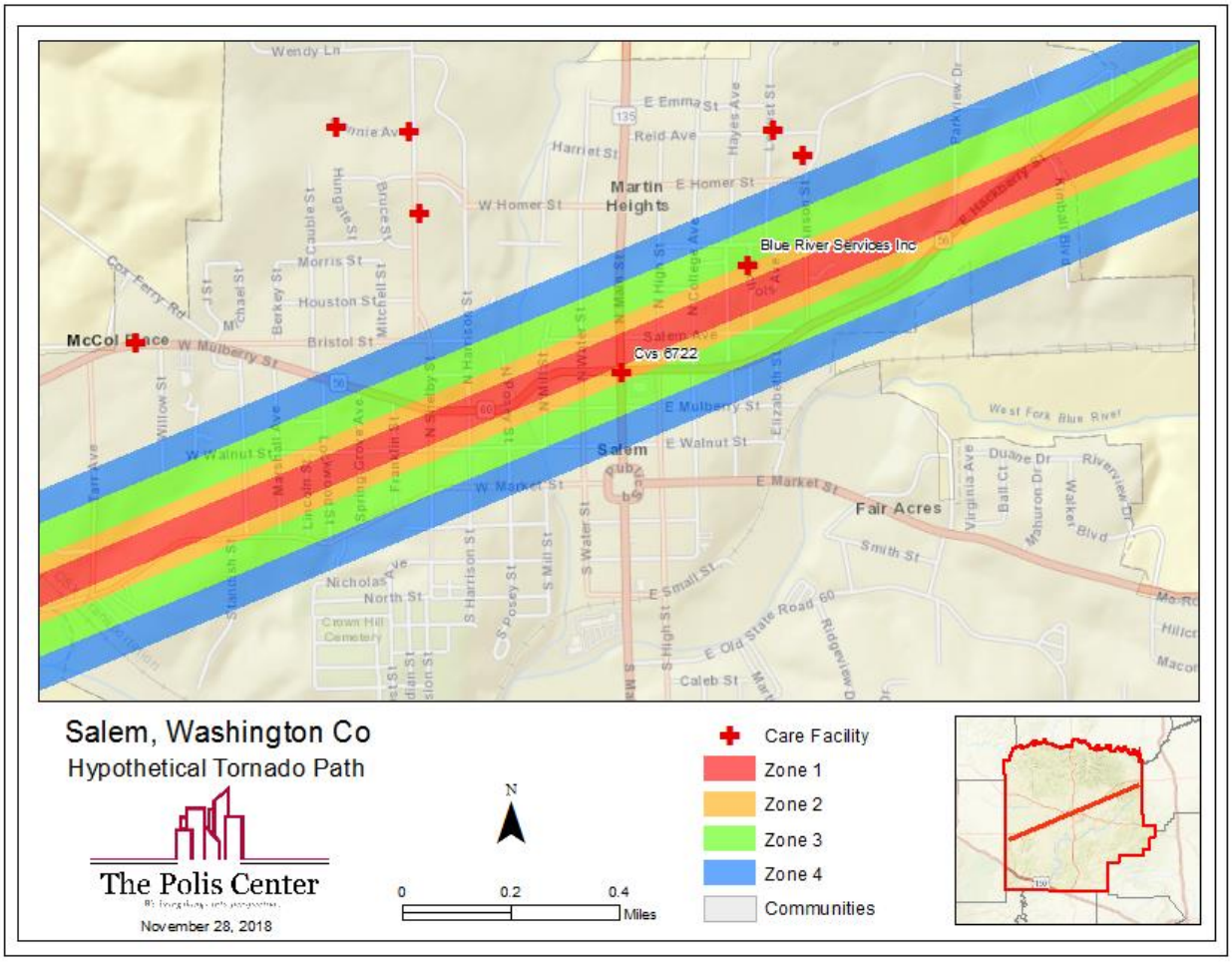

Figure 41. Hypothetical Damages to Essential Facilities, Washington County

4.3.4.8 Community Development Trends and Future Vulnerability

The entire population and buildings have been identified as at risk because summer storms and tornadoes can occur anywhere within the state of Indiana at any time of the day. Furthermore, any future development in terms of new construction within the county will be at risk. The building exposure for Washington County is included in Table 13. All critical facilities in the county and communities within the county are at risk. Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures need to be built with more sturdy construction, and those structures already in place need to be hardened to lessen the potential impacts of severe weather. Community warning sirens to provide warnings of approaching storms are also vital to preventing the loss of property and ensuring the safety of Washington County residents.

4.3.4.9 Relationship to other Hazards

Flooding - Thunderstorms with heavy amounts of rainfall can cause localized flooding, which can impact property and infrastructure such as roads.

Public Health - Public health can be impacted as a result of wastewater spills due to flooding.

Wildland Fire - Lighting strikes may ignite a wildland fire. Windstorms that result in downed timber increase the fuel load in a forest that may increase the risk of wildfire.

Structural Fire - Lighting strikes may ignite a structural fire.

4.3.5 Drought

4.3.5.1 Hazard Definition for Drought

The meteorological condition that creates a drought is below normal rainfall. However, excessive heat can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

The Palmer Drought Severity Index (PDSI), developed by W.C. Palmer in 1965, is a soil moisture algorithm utilized by most federal and state government agencies to trigger drought relief programs and responses. The objective of the PDSI is to provide standardized measurements of moisture, so that comparisons can be made between locations and periods of time—usually months. The PDSI is designed so that a -4.0 in Indiana has the same meaning in terms of the moisture departure from a climatological normal as a -4.0 does in South Carolina.

The U.S. Drought Monitor (USDM) provides a national assessment on drought conditions in the United States. The following table is a reference from the classification scheme provided by the USDM, and the correlation between PDSI and the category, descriptions, and possible impacts associated with those level events. This classification is often used to refer to the severity of

droughts for statistical purposes. The USDM provides weekly data for each county, noting the percent of land cover in the condition of the drought category identified below.

Table 28. USDM Index

Category	Description	Possible Impacts	Palmer Drought Severity Index
D0	Abnormally Dry	Going into drought: -short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits	-1.0 to -1.9
D1	Moderate Drought	-Some damage to crops, pastures -Streams, reservoirs, or wells low, some water shortages developing or imminent -Voluntary water-use restrictions requested	-2.0 to -2.9
D2	Severe Drought	-Crop or pasture losses likely -Water shortages common -Water restrictions imposed	-3.0 to -3.9
D3	**Extreme Drought**	**-Major crop/pasture losses -Widespread water shortages or restrictions**	**-4.0 to -4.9**
D4	**Exceptional Drought**	**-Exceptional and widespread crop/pasture losses -Shortages of water in reservoirs, streams, and wells creating water emergencies**	**-5.0 or less**

In the past decade, the US has continued to consistently experience drought events with economic impacts greater than $1 billion; FEMA estimates that the nation's average annual drought loss is $6 billion to $8 billion. For Indiana alone, the National Drought Mitigation Center reported hundreds of drought impacts in the past decade ranging from water shortage warnings to reduced crop yields and wild fires.

4.3.5.2 Drought History in Washington County

Since the last MHMP, the National Drought Mitigation Center and the Indiana Drought Monitor have recorded several incidences of drought in Washington County.

Washington County experienced a period of drought from the beginning of July through October 2011. At the droughts peak, 100% of land area in Washington County was at category D1 for two weeks. The 2011 drought caused crops to become stressed and livestock deaths. The United States Department of Agriculture designated Washington County as a drought disaster area along with several counties in and around Indiana. To help recovery from the drought, small businesses in Washington County were eligible for aid from the Small Business Administration (SBA) from July 2011 through February 2012.

Like the rest of Indiana, Washington County was affected by the 2012 Central US drought. At the peak of the drought, 100% of the county was at category D3. Low water levels limited recreational activities at Salamonie Lake. Eventually, the water levels got low enough that a previously submerged town became visible in Salamonie Lake. In response to the disaster, the

United States Department of Agriculture streamlined the disaster designation process. More than half of Indiana counties, including Washington County, were declared eligible for SBA loans, and Washington County enacted an open burn ban.

Since the 2012 drought, the National Drought Mitigation Center reported drought impacts in 2015 and 2016. In October 2015, soybeans, winter wheat, and pastures were affected by dryness. During the summer of 2016, Dry weather causing Indiana pastures to brown, crops were stressed from lack of rain, and late planted corn withered.

4.3.5.3 Geographic Location for Drought

Droughts are regional in nature. All areas of the county are vulnerable to the risk of drought.

4.3.5.4 Hazard Extent for Drought

Droughts can be widespread or localized events. The extent of the droughts varies both in terms of the extent of the heat and the range of precipitation.

4.3.5.5 Risk Identification for Drought

In Meeting #2, the planning team determined that the probability of a drought is possible with limited consequences. The warning time for a drought is at least 24 hours with a duration of more than 1 week. The calculated CPRI for drought is 2.05.

4.3.5.6 Vulnerability Analysis for Drought

Drought impacts, as described in the drought history previously, are a distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area.

4.3.5.7 Community Development Trends and Future Vulnerability

Drought impacts, as described in the drought history section, are a threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect varying impacts within the affected area. Future development will remain vulnerable to drought events. Typically, some urban and rural areas are more susceptible than others. Excessive demands for water in populated urban areas place a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of drought.

4.3.5.8 Relationship to other Hazards

Wildfires - A drought situation can significantly increase the risk of wildfire.

Extreme Temperatures - A drought situation can significantly increase with long periods of high temperatures.

4.3.6 Winter Storms: Blizzards, Ice Storms, Snowstorms

4.3.6.1 Hazard Definition for Winter Storm

Severe winter weather consists of various forms of precipitation and strong weather conditions. This may include one or more of the following: freezing rain, sleet, heavy snow, blizzards, icy roadways, extreme low temperatures, and strong winds. These conditions can cause human-health risks such as frostbite, hypothermia, and death.

Ice Storms

Ice or sleet, even in the smallest quantities, can result in hazardous driving conditions and can be a significant cause of property damage. Sleet can be easily identified as frozen raindrops. Sleet does not stick to trees and wires. The most damaging winter storms in Indiana have been ice storms. Ice storms are the result of cold rain that freezes on contact with objects having a temperature below freezing. Ice storms occur when moisture-laden gulf air converges with the northern jet stream, causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain, coating power lines, communication lines, and trees with heavy ice. The winds then will cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication. Falling trees and limbs also can cause building damage during an ice storm. In the past few decades, numerous ice-storm events have occurred in Indiana.

Snowstorms

Significant snowstorms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snowstorm with winds of 35 miles an hour or greater and/or visibility of less than one-quarter mile for three or more hours. The strong winds during a blizzard blow about falling and already existing snow, creating poor visibility and impassable roadways. Blizzards have the potential to result in property damage.

Indiana has been struck repeatedly by blizzards. Blizzard conditions not only cause power outages and loss of communication, potentially for days, but can also make transportation difficult. The blowing of snow can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous, if not deadly.

Damages from blizzards can range from significant snow removal costs to human and livestock deaths. Because of the blinding potential of heavy snowstorms, drivers are also at risk of collisions with snowplows or other road traffic. Stranded drivers can make uninformed decisions, such as leaving the car to walk in conditions that put them at risk. Drivers and homeowners without emergency plans and kits are vulnerable to the life-threatening effects of heavy snow storms such as power outages, cold weather, and inability to travel, communicate, obtain goods or reach their destinations. Heavy snow loads can cause structural damage,

particularly in areas where there are no building codes or for residents living in manufactured home parks.

4.3.6.2 Winter Storm History in Washington County

The NCDC database identified 8 winter storm, heavy snow, ice storm, winter weather, or blizzard events for Washington County since 2011. In February 2015 Emergency Management reported a heavy snow event with no recorded injuries, deaths, or associated damage costs. However, the heavy, wet nature of the snow led to sporadic power outages. In December 2015, a combination of freezing rain and wind gusts up to 40mph created scattered power outages and downed trees. Slick spots on mainly elevated surfaces made travel difficult and a few accidents were reported. Additional details for NCDC events are included in Appendix C.

4.3.6.3 Geographic Location for Winter Storm

Severe winter storms are regional in nature. Most of the NCDC data is calculated regionally or in some cases statewide.

4.3.6.4 Hazard Extent for Winter Storm

The extent of the historical winter storms varies in terms of storm location, temperature, and ice or snowfall. A severe winter storm can occur anywhere in the jurisdiction.

4.3.6.5 Risk Identification for Winter Storm

In Meeting #2, the planning team determined that the potential for a winter storm is likely with limited consequences. The warning time for a winter storm is 12-24 hours with a duration of less than 1 week. The calculated CPRI for a winter storm is 2.55.

4.3.6.6 Vulnerability Analysis for Winter Storm

Winter storm impacts are equally distributed across the entire jurisdiction; therefore, the entire county is vulnerable to a winter storm and can expect the same impacts within the affected area. A table of the building exposure in terms of types and numbers of buildings for the entire county is listed in Table 11. The impacts to the general buildings within the county are similar to the damages expected to the critical facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

During a winter storm, the types of infrastructure that could be impacted include essential and critical facilities, roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable it is important to emphasize that any number of these items could become damaged during a winter storm. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

4.3.6.7 Community Development Trends and Future Vulnerability

Any new development within the county will remain vulnerable to these events. Because the winter storm events are regional in nature, future development will be equally impacted across the county.

4.3.6.8 Relationship to other Hazards

Flooding - Melting from heavy snows can cause localized flooding which can impact property and infrastructure such as roads.

Wildland or Structural Fire - Heavy storms that result in large amounts of downed timber can result in an increase of dead or dying trees left standing, thus providing an increased fuel load for a wildfire. There is an additional risk of increased frequency of structural fires during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents.

Public Safety - Drivers stranded in snowstorms may make uninformed decisions that can put them at risk; residents who are unprepared or vulnerable may not be able to obtain goods or reach their destinations. EMS providers may be slowed by road conditions to respond to emergencies. Ice storms may result in power outages due to downed power lines, putting people at risk for cold temperature exposure and reducing the ability to spread emergency messages to the public via television, radio or computer.

4.3.7 Extreme Temperatures

4.3.7.1 Hazard Definition for Extreme Temperatures

Extreme Cold

What constitutes an extreme cold event and its effects varies by region across the US. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.” Extreme cold temperatures are typically characterized by the ambient air temperature dropping to approximately zero degrees Fahrenheit or below.

Exposure to cold temperatures—indoors or outdoors—can lead to serious or life-threatening health problems, including hypothermia, cold stress, frostbite or freezing of the exposed extremities, such as fingers, toes, nose, and earlobes. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, individuals who are homeless or stranded, or those who live in a home that is poorly insulated (such as mobile homes) — or without heat are at greater risk to the effects of extreme cold.

The magnitude of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. WCT are the temperatures felt outside and is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin’s temperature to drop.

In 2001, the NWS implemented a new WCT Index, designed to more accurately calculate how cold air feels on human skin. The index, shown in Figure 42, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

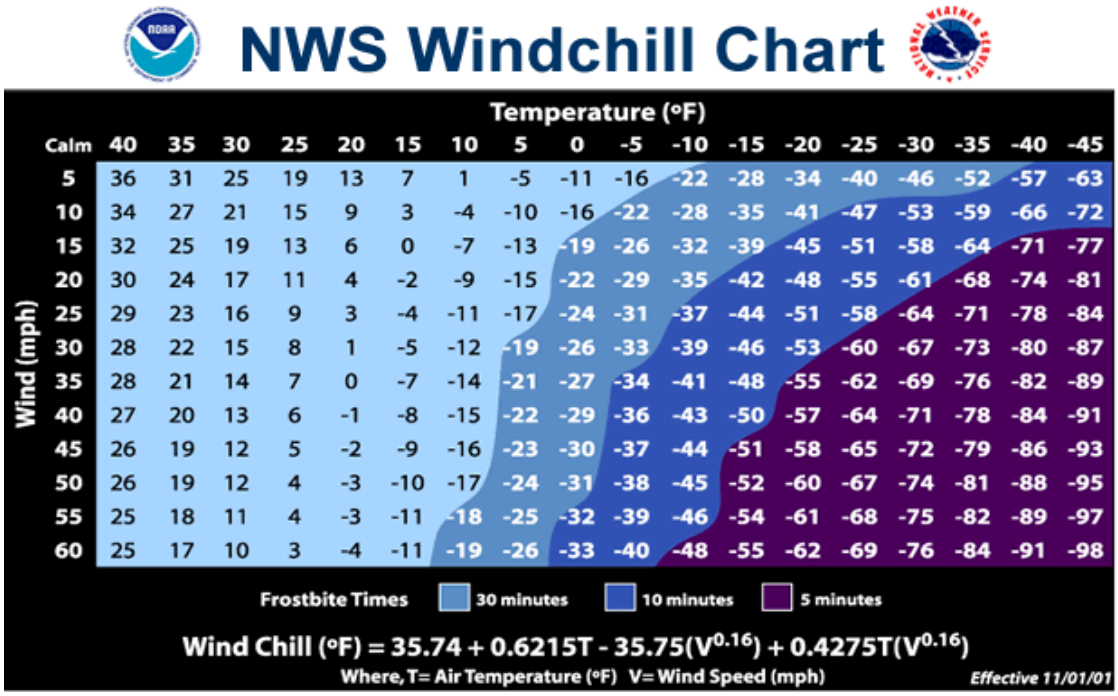

Figure 42. NWS Wind Chill Temperature Index

Extreme Heat

Human beings need to maintain a constant body temperature if they are to stay healthy. Working in high temperatures induces heat stress when more heat is absorbed into the body than can be dissipated out. Heat illness such as prickly heat, fainting from heat exhaustion, or heat cramps are visible signs that people are working in unbearable heat. In the most severe cases, the body temperature control system breaks down altogether and body temperature rises rapidly. This is a heat stroke, which can be fatal. The NWS issues a heat advisory when, during a 24-hour period, the temperature ranges from 105°F to 114°F during the day, and remains at or above 80°F at night.

Heat is the leading weather-related killer in the United States, even though most heat-related deaths are preventable through outreach and intervention. According to the National Oceanic and Atmospheric Administration, the summer of 2016 was one of the five hottest on record dating to the late 19th century.

Unusually hot summer temperatures have become more frequent across the contiguous 48 states in recent decades (see the High and Low Temperatures indicator), and extreme heat events (heat waves) are expected to become longer, more frequent, and more intense in the future. As a result, the risk of heat-related deaths and illness is also expected to increase.

Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat wave. Most summers see EHEs in one or more parts east of the Rocky Mountains. They tend to combine both high temperatures and high humidity; although some of the worst heat waves have been catastrophically dry.

Heat alert procedures are based primarily on Heat Index Values. The Heat Index—given in degrees Fahrenheit—is often referred to as the apparent temperature and is a measure of how hot it really feels when the relative humidity is factored with the actual air temperature. The National Weather Service Heat Index Chart can be seen in Figure 43.

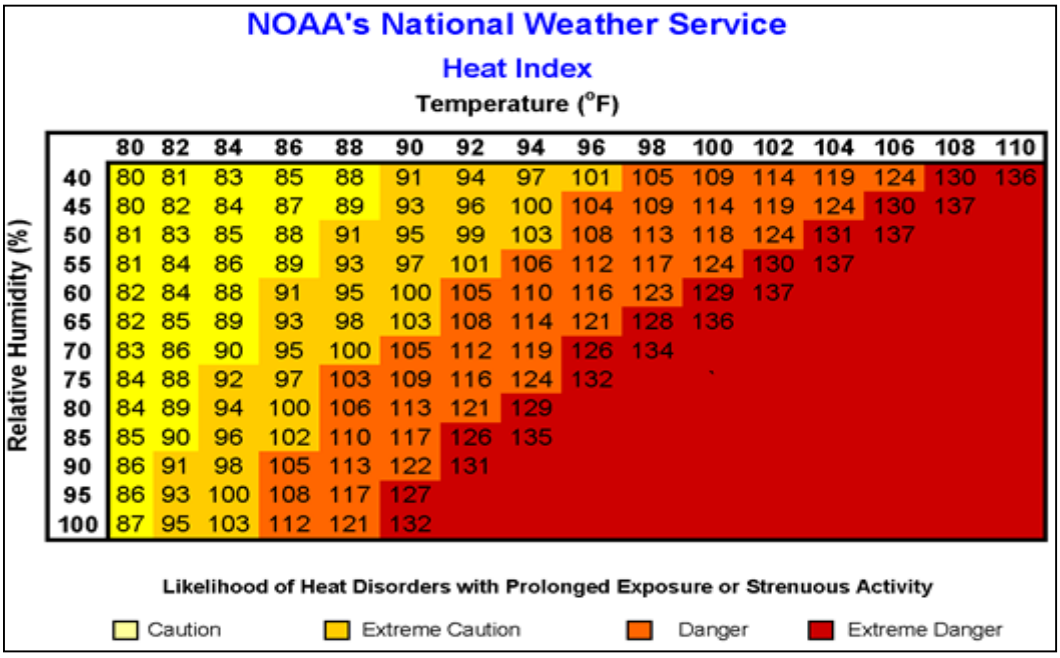

Figure 43. National Weather Service Heat Index
Source: Office of Atmospheric Programs. (2006). Excessive Heat Events Guidebook. Unites States Environmental Protection Agency. Washington, D.C.

4.3.7.2 Extreme Temperature History in Washington County

The NCDC reported two occurrences of extreme temperatures in Washington County since the previous plan. Both records were extreme cold. The two recent extreme cold events occurred in January 2014 and January 2015 respectively. The 2014 event resulted in deadly wind chill values between 30 and 45 degrees below zero, and in Washington County strong winds caused significant snow drifting, leaving roads impassable in areas. There were numerous reports of accidents due to slick roadways and many businesses and schools were closed. A similar event occurred a year later in 2015 when wind chill temperatures ranged between 20 to 30 degrees below zero. There were numerous school closings and delays, but no reported injuries or property damage.

4.3.7.3 Geographic Location for Extreme Temperature

Extreme temperatures are regional in nature. All areas of the Washington County are vulnerable to the risk of extreme cold or extreme heat.

4.3.7.4 Hazard Extent for Extreme Temperature

Extreme temperatures are normally widespread events.

4.3.7.5 Risk Identification for Extreme Temperature

In Meeting #2, the planning team determined that the probability of an extreme temperature hazard is likely with limited consequences. Extreme temperatures were determined to have a warning time of more than 24 hours with a duration less than one week. The calculated CPRI for extreme temperatures in Washington County is 2.5.

4.3.7.6 Vulnerability Analysis for Extreme Temperature

Extreme temperature impacts are an equally distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat.

Prolonged exposure to extreme heat may lead to serious health problems, including heat stroke, heat exhaustion, or sunburn. Certain populations — such as seniors age 65 and over, infants and young children under five years of age, pregnant women, the homeless or poor, the obese, and people with mental illnesses, disabilities, and chronic diseases — are at greater risk to the effects of extreme heat and extreme cold. Depending on severity, duration, and location these populations may not have ready access to cooling or warming centers.

4.3.7.7 Community Development Trends and Future Vulnerability

Because extreme temperatures are regional in nature, future development will be impacted across the county. Although urban and rural areas are equally vulnerable to this hazard, those living in urban areas may have a greater risk from the effects of a prolonged heat wave. The atmospheric conditions that create extreme heat tend to trap pollutants in urban areas, adding contaminated air to the excessively hot temperatures and creating increased health problems. Furthermore, asphalt and concrete store heat longer, gradually releasing it at night and producing high nighttime temperatures. This phenomenon is known as the “urban heat island effect.” Local officials should address extreme temperature hazards by educating the public on steps to take before and during the event and locations of cooling and warming centers.

4.3.7.8 Relationship to other Hazards

Drought and Wildfire - Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Public Safety - Anyone exposed to extreme heat can develop heat exhaustion and heat stroke. The elderly, children and those who engage in outdoor work or recreation may be most susceptible to the danger of extreme heat.

4.3.8 Hazardous Material Release

4.3.8.1 Hazard Description for Hazardous Material Release

The State of Indiana has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances between our borders every day. The transportation of chemicals and substances along interstate routes is commonplace in Indiana. The rural areas of Indiana have considerable agricultural commerce, creating a demand for fertilizers, herbicides, and pesticides to be transported along rural roads. Finally, Indiana is bordered by two major rivers and Lake Michigan. Barges transport chemicals and substances along these waterways daily. These factors increase the chance of hazardous material releases and spills throughout the State of Indiana.

The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials and chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. Emergency response may require fire, safety and law enforcement, search and rescue, and hazardous materials units.

4.3.8.2 Hazardous Incident History in Washington County

Washington County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in multiple deaths or serious injuries, although there have been many minor releases that have put local firefighters, hazardous materials teams, emergency management, and local law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Washington County residents.

4.3.8.3 Geographic Location for Hazardous Material Release

The hazardous material hazards are countywide and are primarily associated with the transport of materials via highway, railroad, and/or river barge.

4.3.8.4 Hazard Extent for Hazardous Material Release

The extent of the hazardous material (referred to as hazmat) hazard varies in terms of the quantity of material being transported as well as the specific content of the container. Hazardous material impacts are an equally distributed threat across the entire jurisdiction; therefore, the entire county is vulnerable to a hazardous material release and can expect the same impacts within the affected area. The main concern during a release or spill is the population affected. This plan will therefore consider all buildings located within the county as vulnerable.

4.3.8.5 Risk Identification for Hazardous Material Release

In Meeting #2, the planning team determined that the probability of a hazardous materials release was possible with limited consequences. Hazardous materials releases were determined to have a warning time of less than six hours with a duration longer than 1 week. The calculated CPRI for earthquakes in Washington County is 2.5.

4.3.8.6 Vulnerability Analysis for Hazardous Materials Release

The hazardous material release hazards are countywide and primarily are associated with the transport of materials by highway and/or railroad. During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response.

4.3.8.7 GIS Hazmat Analysis

The U.S. EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for an anhydrous ammonia release at the CSX railroad tracks at North Sycamore Street located centrally in the Town of Campbellsburg.

ALOHA generates a threat zone area where a hazard (such as toxicity or thermal radiation) has exceeded a user-specified Level of Concern (LOC). ALOHA will display up to three threat zones overlaid on a single picture. Through the development of Acute Exposure Guideline Levels (AEGLs) are exposure guidelines designed to help responders deal with emergencies involving chemical spills or other catastrophic events where members of the general public are exposed to a hazardous airborne chemical.

AEGLs are intended to describe the health effects on humans due to once-in-a-lifetime or rare exposure to airborne chemicals. The National Advisory Committee for AEGLs is developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills or other catastrophic exposures.

- **Zone 1 (AEGL 1):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure
- **Zone 2 (AEGL 2):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape

- **Zone 3 (AEGL 3):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). Figure 44 is an illustration of the toxic threat plume footprint as determined by ALOHA.

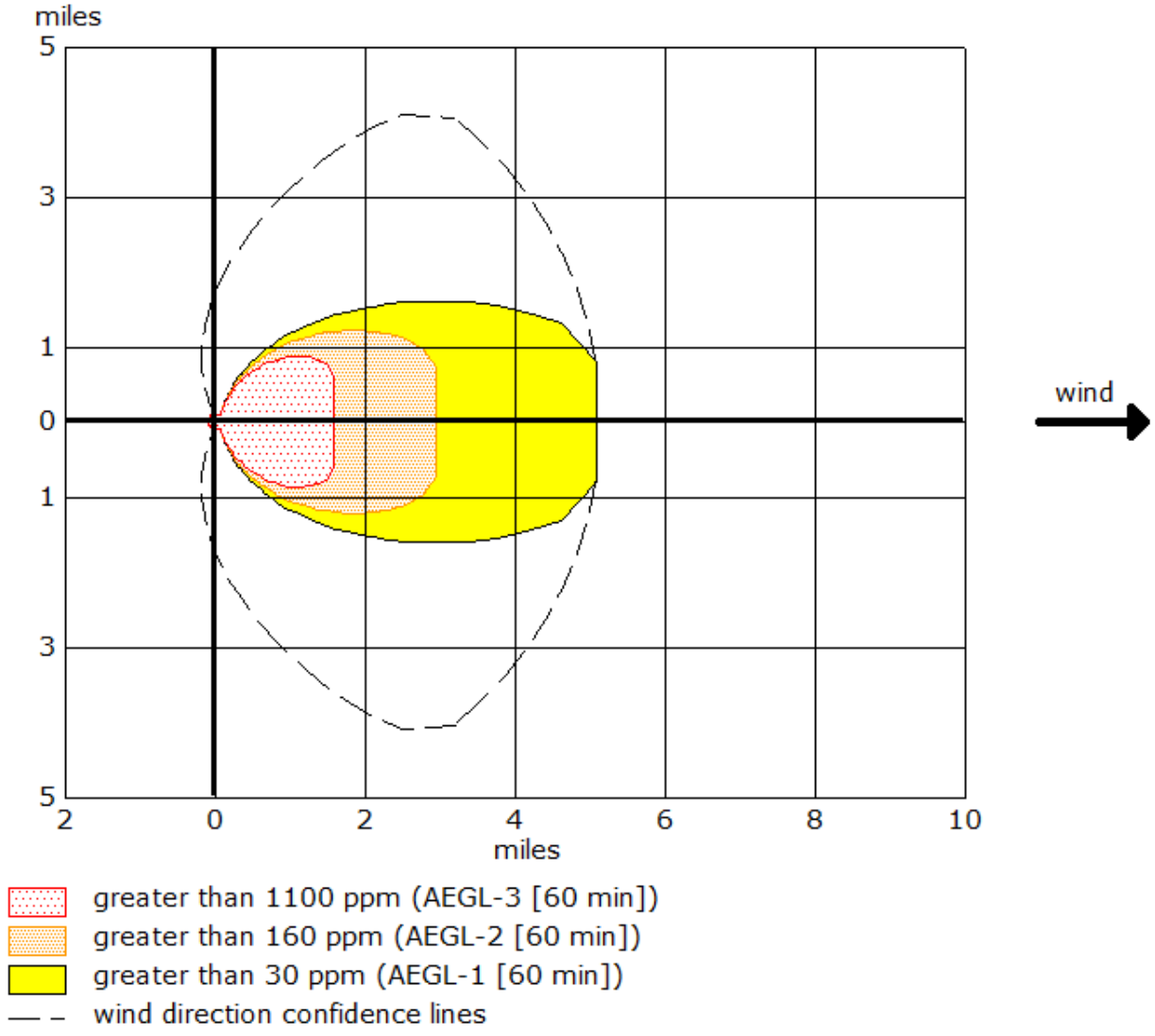

Figure 44. Toxic Threat Plume Footprint Generated by ALOHA

For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the west were assumed, and the ALOHA atmospheric modeling parameters were based on the actual conditions at the location when the model was run including wind speed of 5 mph. The temperature was 68°F with 75% humidity and clear skies.

This modeled release was based on a leak from 2.5 feet-diameter hole in the tank. According to the ALOHA parameters, approximately 1,050 pounds of material would be released per second. Figure 45 shows the location of the release.

Figure 45. Location of Release

The Washington County Building Inventory was added to ArcMap and overlaid with the threat zone footprint. The Building Inventory was then intersected with each of the three footprint areas to classify each point based upon the plume footprint in which it is located. Figure 46 depicts the Washington County Building Inventory after the intersect process.

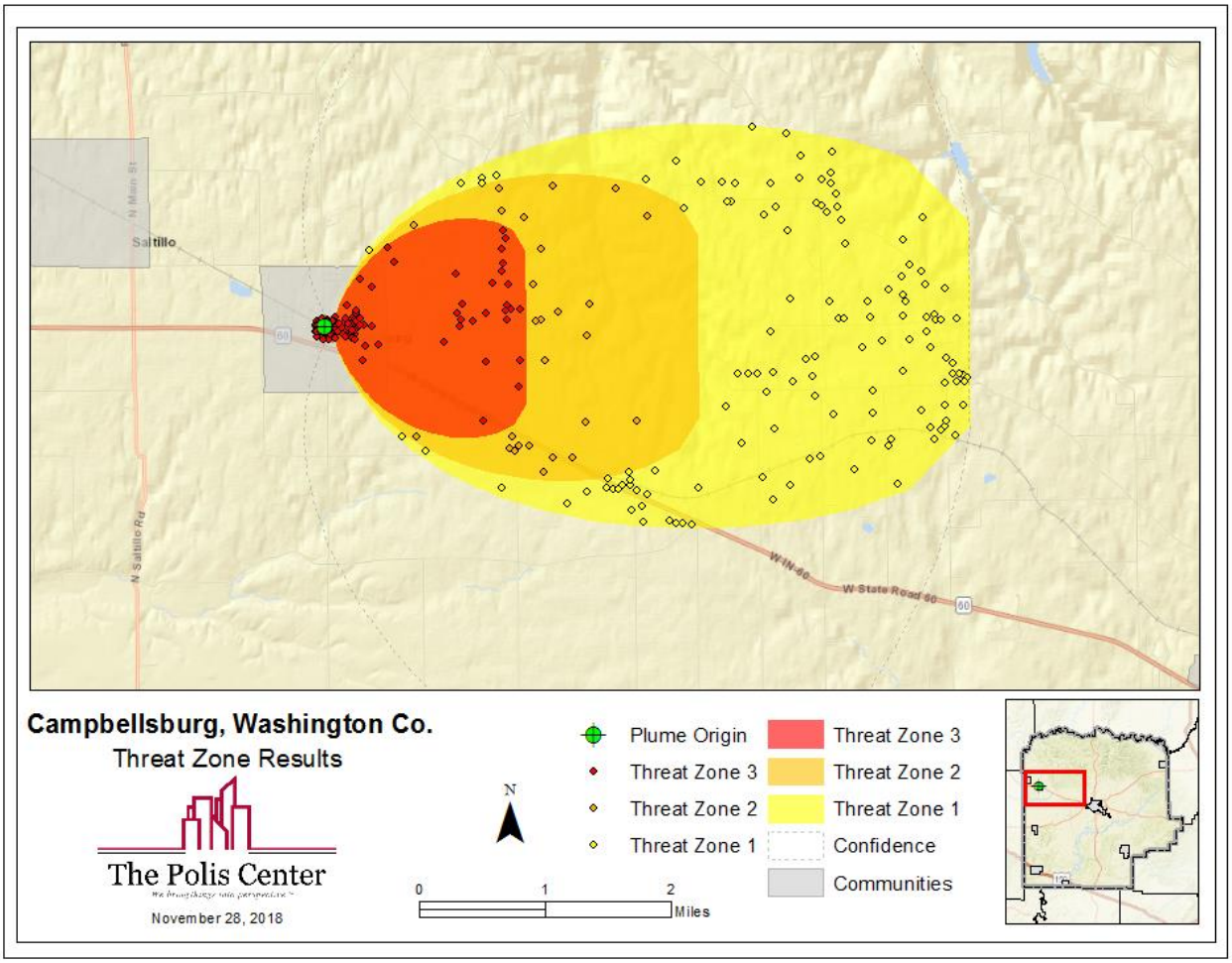

Figure 46. Location of Release and Building Inventory by Threat Zone

The results of the analysis against the Building Inventory counts are depicted in Table 29.

Table 29. Estimated Exposure for all Threat Zones

	Number of Buildings within the Hazmat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	13	13	55
Commercial	7	0	4
Education	0	0	0
Government	8	0	0
Industrial	0	0	0
Religious	5	6	1
Residential	76	7	69
Total	109	26	129

Table 30 summarizes the replacement costs of buildings within each threat zone. Values represent only those portions of each zone that are not occupied by other zones.

Table 30. Estimated Replacement Cost for all Threat Zones

	Replacement Cost of Buildings within the Hazmat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	$ 3,814,154	$ 7,021,633	$ 28,758,086
Commercial	$ 3,368,900	$ 0	$ 3,343,662
Education	$ 0	$ 0	$ 0
Government	$ 2,570,803	$ 0	$ 0
Industrial	$ 0	$ 0	$ 0
Religious	$ 3,510,989	$ 14,367,676	$ 300,856
Residential	$ 11,361,390	$ 1,308,134	$ 10,606,746
Total	$ 24,626,236	$ 22,697,443	$ 43,009,350

Essential Facilities

All facilities affected by the plume have been mapped and labeled in Figure 47. Appendix E contains a map and list of critical facilities that fall in the plume.

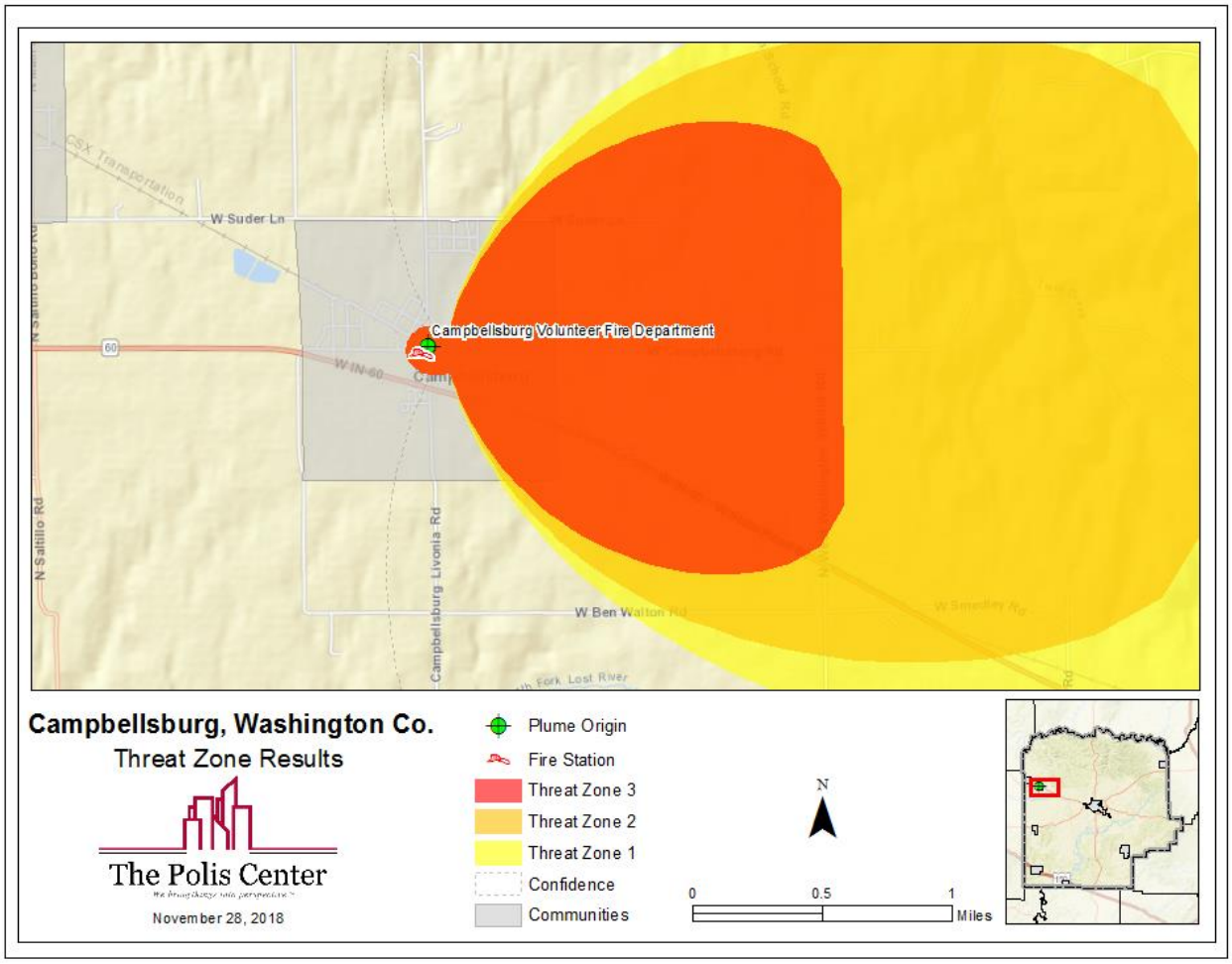

Figure 47. Essential Facilities Located in Threat Zone

4.3.8.8 Community Development Trends and Future Vulnerability

Because the hazardous material hazard events may occur anywhere within the county, future development will be impacted, especially development along major roadways. The major transportation routes and the industries located in Washington County pose a threat of dangerous chemicals and hazardous materials release.

4.3.8.9 Relationship to other Hazards

Flood- Hazmat incidents are likely when flood incidents occur. Hazardous material storage containers can become compromised due to flooding.

4.3.9 Dam and Levee Failure

4.3.9.1 Hazard Definition for Dam and Levee Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, creating the potential for failure. The same potential exists for

levees when they serve their purpose, which is to confine flood waters within the channel area of a river and exclude that water from land or communities land-ward of the levee. Dams and levees can fail due to either 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, security leads to new construction, added infrastructure, and increased population over time. Levees in particular are built to hold back flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that maximum is exceeded by more than the design safety margin, the levee will be overtopped or otherwise fail, inundating communities in the land previously protected by that levee. It has been suggested that climate change, land-use shifts, and some forms of river engineering may be increasing the magnitude of large floods and the frequency of levee failure situations.

In addition to failure that results from extreme floods above the design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require constant monitoring and regular maintenance to assure their integrity. Many structures across the U.S. have been under-funded or otherwise neglected, leading to an eventual day of reckoning in the form either of realization that the structure is unsafe or, sometimes, an actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Low-Head Dams

Another type of dam low-head, or in-channel, dams can present a safety hazard to the public because of their ability to trap victims in a submerged hydraulic jump formed just downstream from the dam. Recent deaths and injuries around these structures in the state, have brought the attention of this issue to the surface for local, state and federal officials. Current initiatives led by the Indiana Silver Jackets—a multi-agency coalition that leverages efforts to address natural hazards—have focused on the identification of these dams statewide, as well as various efforts to notify the public on their dangers.

Non-Levee Embankments

Along with accredited levees regulated by federal agencies, there are also what are referred to as Non-Levee Embankments (NLE), which typically parallel to the direction of natural flow. An embankment is an artificial mound of soil or broken rock that supports railroads, highways,

airfields, and large industrial sites in low areas, or impounds water. NLEs are often highways or railroads built on fill in low lying areas and thus tend to impose lateral constraints on flood flows, and typically contain the following characteristics:

- NLEs are elevated linear features adjacent to waterways and within the floodplain.
- They are typically man-made and include agricultural embankments built by landowners and road and railroad embankments banks.
- They are levee-like structures, but are not certified or engineered to provide flood protection.

The National Committee on Levee Safety estimates that the location and reliability status of 85% of the nation's NLEs are unknown. In Indiana, majority of NLEs are unidentified and are typically not maintained. NLEs impose lateral constraints on flood flows, reducing the floodplain storage capacity and increasing the flood velocity. As a result, downstream flooding and the potential for stream erosion can increase. As such, NLE's can give a false sense of security and protection to the people residing near NLEs. For these reasons, it is extremely important to map where these features are located.

Living with levees is a shared responsibility. While levees are in operation, maintaining levee systems are the levee sponsor responsibility. Local officials are adopting protocols and procedures for ensuring public safety and participation in the NFIP.

4.3.9.2 Dam and Levee Failure History in Washington County

According to the Washington County Hazard Analysis, there are no records or local knowledge of any dam or certified levee failure in the county.

4.3.9.3 Geographic Location for Dam and Levee Failure

A review of the IDNR dam database revealed 27 state regulated dams located in Washington County and two federally regulated dams. Table 31 summarizes the dam information and Figure 48 maps the dams on a county level. High hazard dams are individually mapped in the vulnerability section. Washington County does not have any in channel dams. A review of the Army Corp of Engineers (USACE) and Indiana Department of Natural Resources' data identified no certified levees in the county. There are, however, 35 non-levee embankments in the county that could be of concern to the planning team. They are mapped in Figure 49.

Table 31. Indiana Department of Natural Resources Dam Inventory

Dam Name	Hazard Rank	EAP?
Delaney Creek Dam No. 16	HIGH	NO
Elk Creek Dam No. 9	SIGNIFICANT	NO
Salinda Lake Dam	HIGH	NO
Peek-A-Boo Lake Dam	HIGH	NO
Delaney Creek Dam No. 1	HIGH	NO
Twin-Rush Dam No. 2	HIGH	NO

Crystal Lake Dam	HIGH	NO
Elk Creek Dam No. 8	SIGNIFICANT	NO
Twin–Rush Dam No. 3	HIGH	YES
Delaney Creek Dam No. 3	HIGH	NO
Delaney Creek Dam No. 14	HIGH	NO
Jordan Lake Dam	HIGH	NO
Elk Creek Dam No. 2	SIGNIFICANT	NO
Delaney Creek Dam No. 5	SIGNIFICANT	NO
Elk Creek Dam No. 6	LOW	NO
Palmyra Lake Dam	LOW	NO
Elk Creek Dam No. 3	SIGNIFICANT	NO
Elk Creek Dam No. 1	SIGNIFICANT	NO
Delaney Creek Dam No.4	LOW	NO
Delaney Creek Dam No. 15	LOW	NO
Elk Creek Dam No. 7	SIGNIFICANT	NO
Delaney Creek Dam No. 13	LOW	NO
Delaney Creek Dam No. 10	LOW	NO
Delaney Creek Dam No. 12	HIGH	NO
Twin-Rush Dam No. 1	HIGH	YES
Delaney Creek Dam No. 11	HIGH	NO
Delaney Creek Dam No. 2	HIGH	NO

*According to IDNR, this is not a state-regulated dam but it is federally regulated.

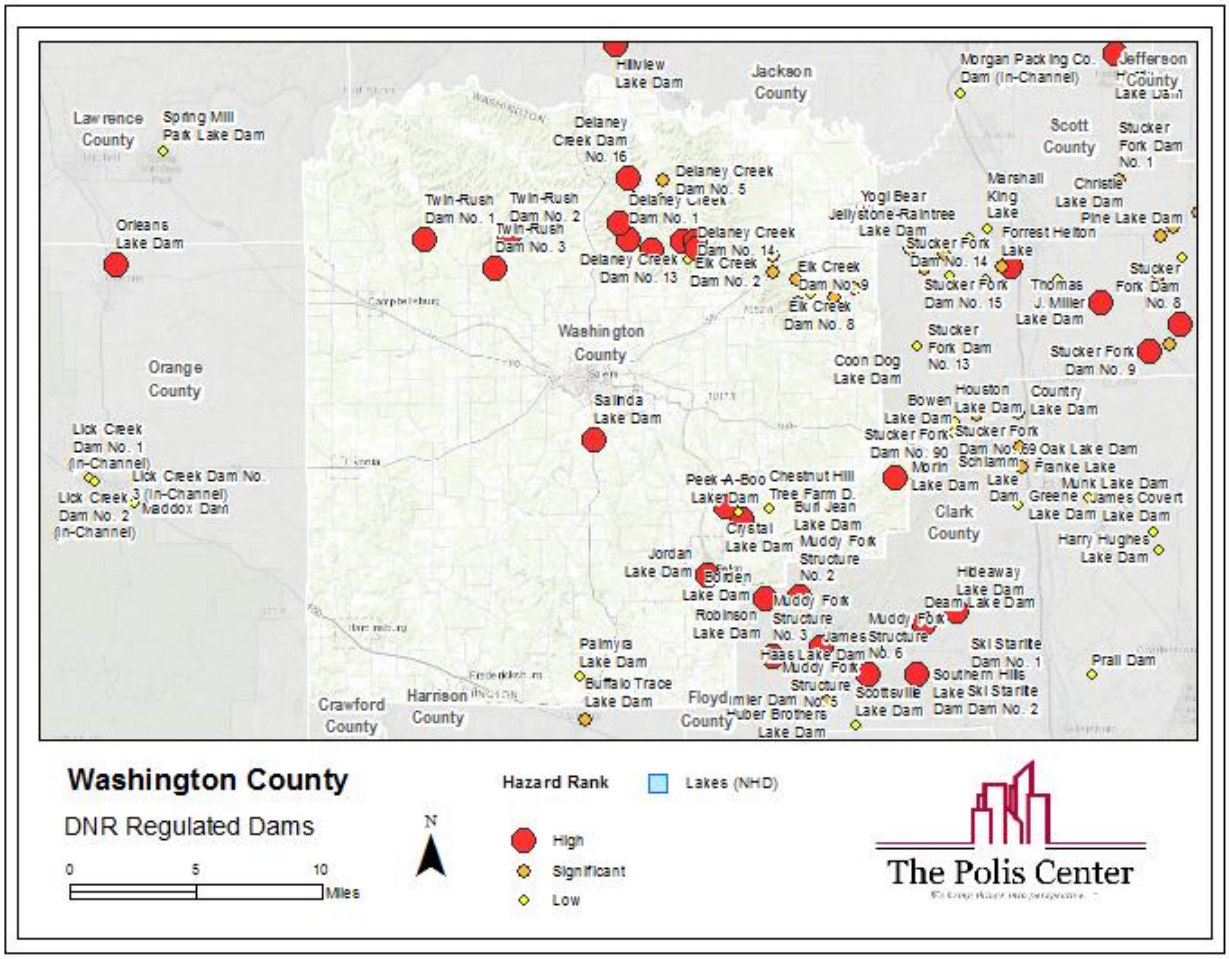

Figure 48. Washington County DNR Regulated Dams with Hazard Classification

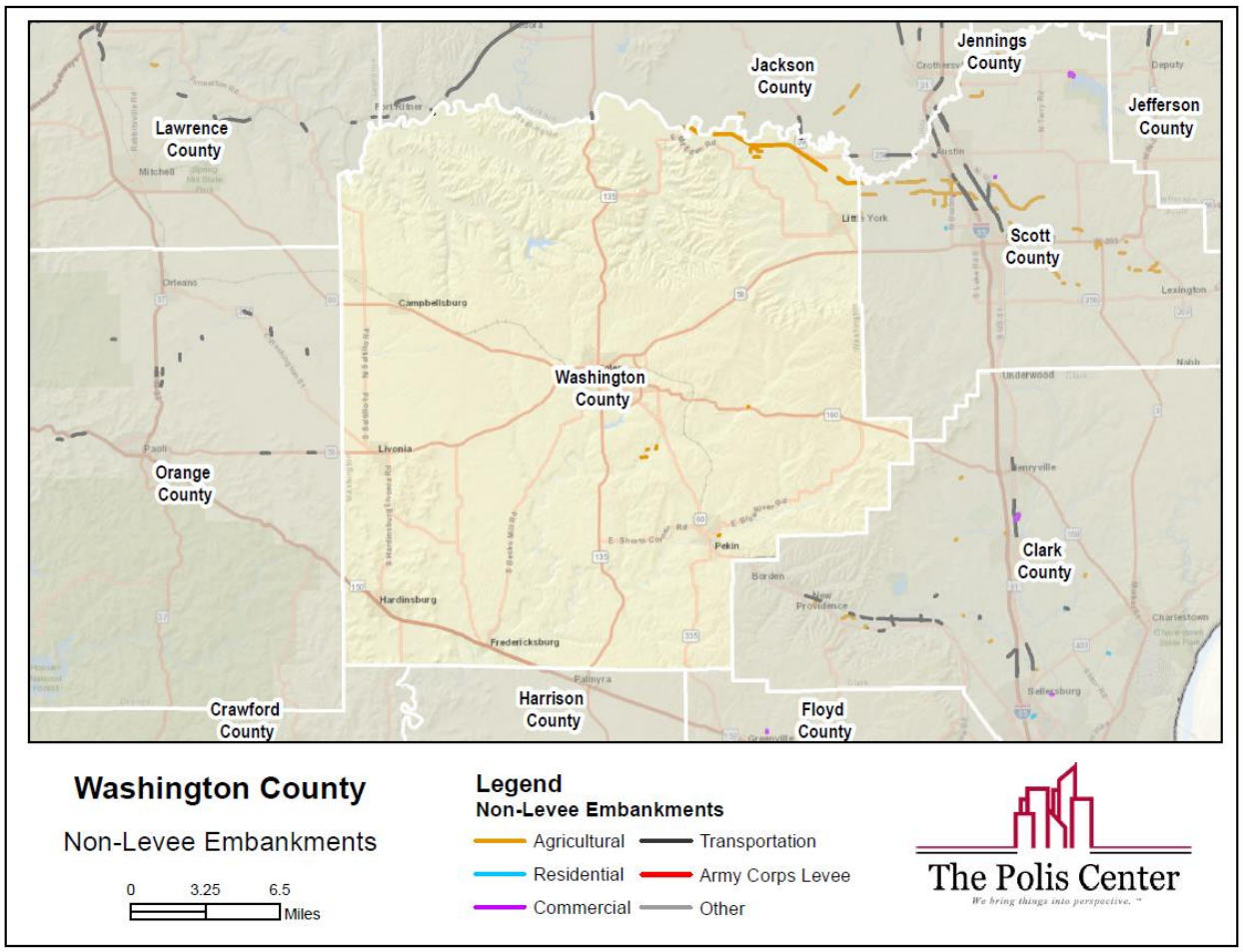

Figure 49. Washington County Non-Levee Embankments

4.3.9.4 Hazard Extent for Dam and Levee Failure

When dams are assigned the low (L) hazard potential classification, it means that failure or incorrect operation of the dam will result in no human life losses and no economic or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant (S) hazard classification are those dams in which failure or incorrect operation results in no probable loss of human life; however, it can cause economic loss, environment damage, and disruption of lifeline facilities. Dams classified as significant hazard potential dams are often located in predominantly rural or agricultural areas, but could be located in populated areas with a significant amount of infrastructure. Dams assigned the high (H) hazard potential classification are those dams in which failure or incorrect operation has the highest risk to cause loss of human life and significant damage to buildings and infrastructure.

According to IDNR and the National Inventory of Dams, one dam was classified as high hazard, and was recorded as having an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana but is strongly recommended in the 2003 Indiana Dam Safety & Inspection Manual.

Accurate mapping of the risks of flooding behind levees depends on knowing the condition and level of protection the levees actually provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps clearly reflect the flood protection capabilities of levees, and that the maps accurately represent the flood risks posed to areas situated behind them. Levee owners—usually states, communities, or in some cases private individuals or organizations—are responsible for ensuring that the levees they own are maintained according to their design. In order for a dam or levee to be considered a creditable flood protection structure on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the one-percent-annual-chance flood.

4.3.9.5 Risk Identification for Dam and Levee Failure

In Meeting #2, the planning team determined that the probability of dam or levee failure is unlikely and with negligible consequences. The warning time for dam or levee failure is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for dam or levee failure is 1.55.

4.3.9.6 Vulnerability Analysis for Dam and Levee Failure

Washington County has 14 high hazard dams, however only 2 have an Emergency Action Plan. They have been mapped below. The 12 high hazard dams without an EAP have been mapped and are located in Appendix E.

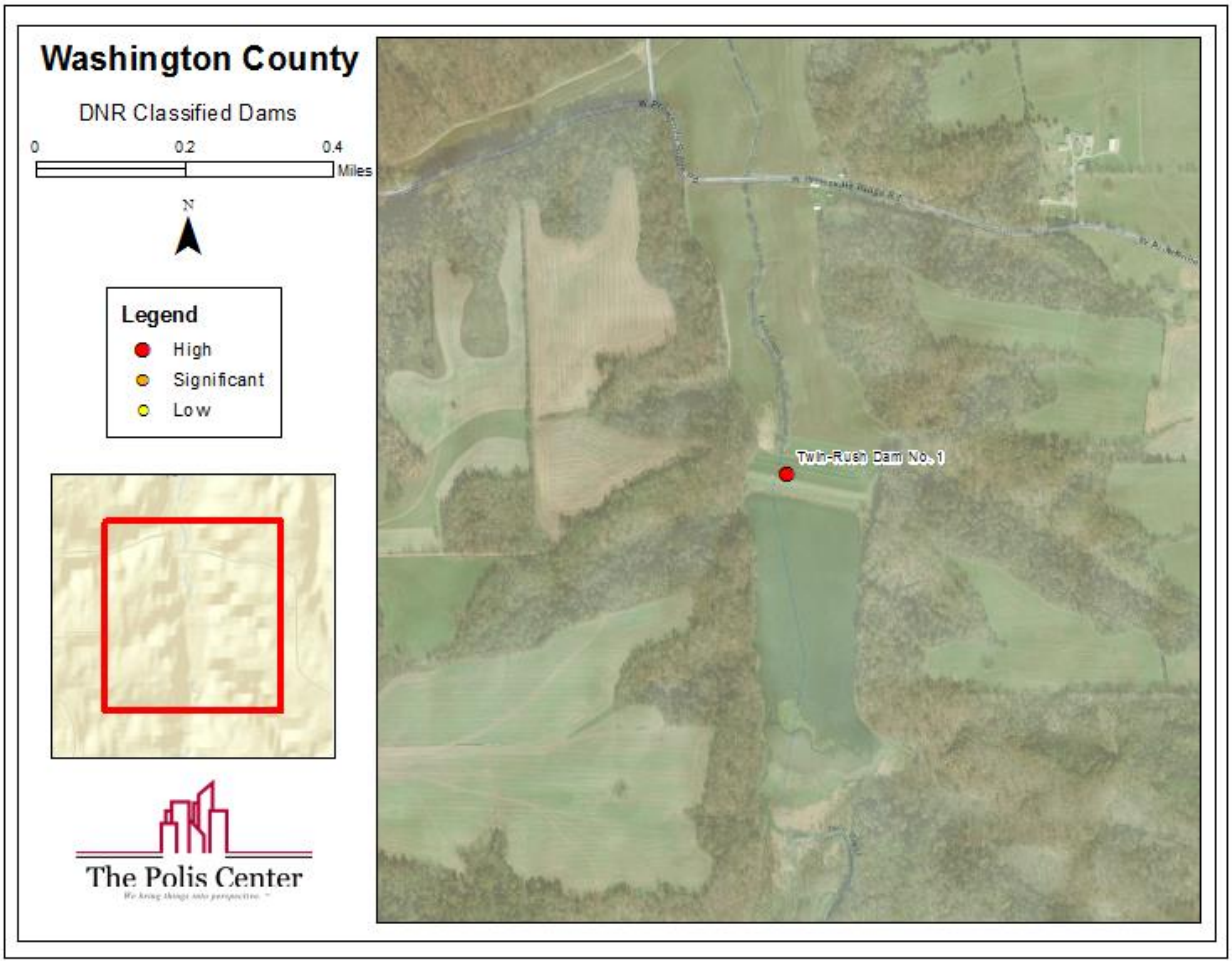

Figure 50. Washington County High Hazard Dams, Twin-Rush Dam No. 1

As part of the mitigation plan update process, the IEAP (Incident Emergency Action Plan) for the Twin-Rush Dam No. 1 was reviewed. The inundation map showed that several homes were at risk of flooding in the event of a dam breach. There were also several roads that could be impacted and the inundation area stretched nearly to the Jackson County & Washington County norther border. The map also indicated several areas that could become cut off in the event of a dam breach. These areas were marked as additional homes to be warned.

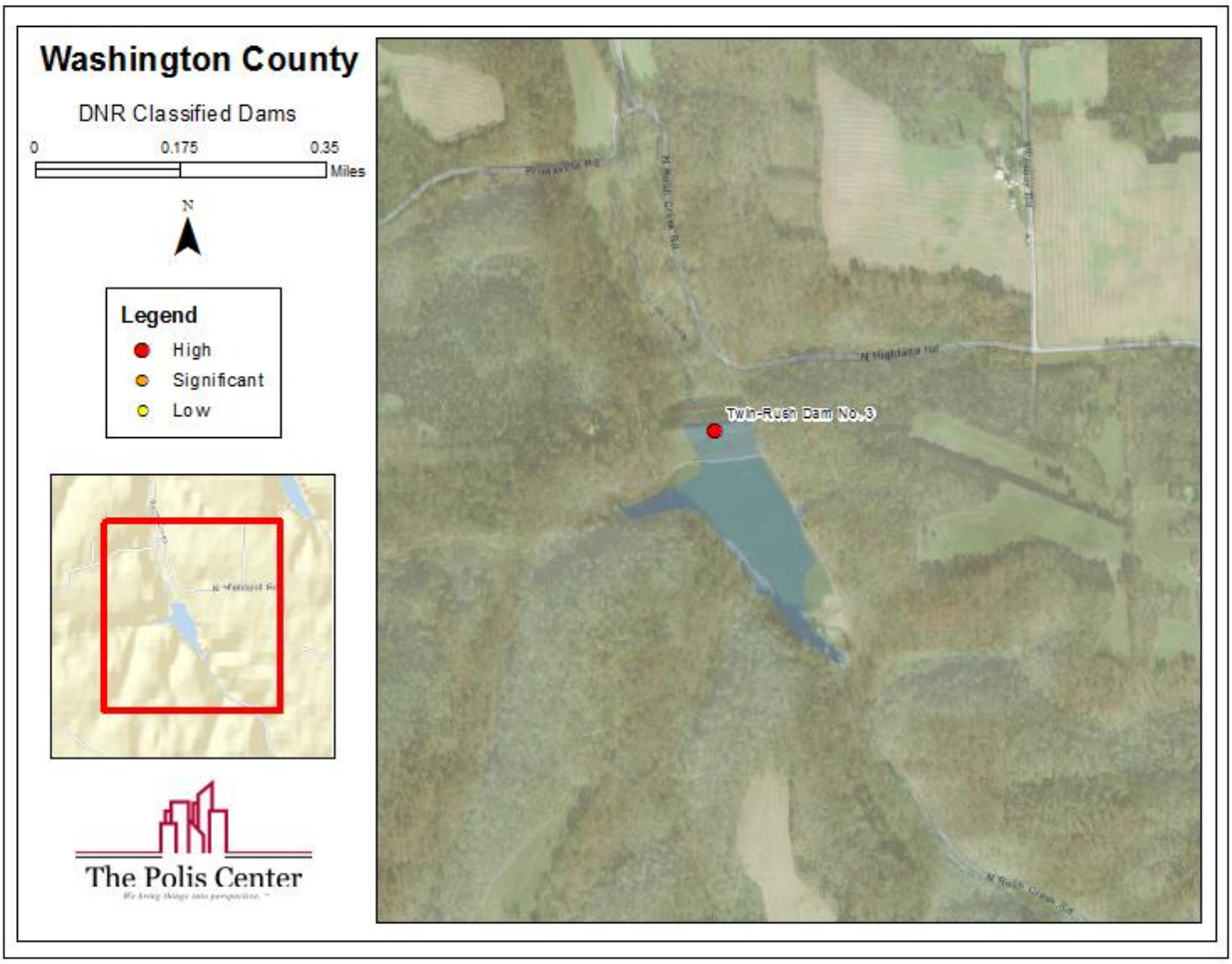

Figure 51. Washington County High Hazard Dams, Twin-Rush Dam No. 3

The IEAP for Twin-Rush Dam No. 3 was also reviewed for the mitigation plan update. There were several homes at risk along with some local roads that could be impacted in the event of a dam breach. The IEAP also identified several areas that could become cut off and should be warned if the dam were to breach.

The extent of potential levee failure varies across the county. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the "one-percent-annual chance" flood. If this accreditation is maintained, portions that would be mapped as Special Flood Hazard Area appear on a FIRM map as Zone X, protected by levee. A review of the USACE and FEMA data identified no certified levee segments in Washington County. As mentioned previously, Washington County has several Non-Levee Embankments that were mapped as part of a state wide project. While these NLEs cannot be regulated, they none the less can affect the flow of flood waters. Washington County showed no significant NLEs near major areas of population or essential facilities.

4.3.9.7 Community Development Trends and Future Vulnerability

The county recognizes the importance of maintaining its future assets, infrastructure, and residents. Inundation maps can highlight the areas of greatest vulnerability in each community. The Washington County Planning Commission reviews new development for compliance with the local zoning ordinance.

4.3.9.8 Relationship to Other Hazards

Flooding – Flooding is typically the leading cause of dam or levee failure incidents.

Drought – Property owners living around dams may have problems accessing boating equipment during times of drought.

4.3.10 Wildfire

4.3.10.1 Hazard Definition for Wildfire

The hazard extent of wildfires is greatest in the heavily forested areas of southern Indiana. The IDNR Division of Forestry assumes responsibility for approximately 7.3 million acres of forest and associated wild lands, including state and privately-owned lands. Indiana’s wildfire seasons occur primarily in the spring—when the leaf litter on the ground dries out and before young herbaceous plants start to grow and cover the ground (green up)—and in the fall—after the leaves come down and before they are wetted down by the first heavy snow. During these times, especially when weather conditions are warm, windy, and with low humidity, cured vegetation is particularly susceptible to burning. When combined, fuel, weather, and topography, present an unpredictable danger to unwary civilians and firefighters in the path of a wildfire. Human action can not only intervene to stop the spread of wildfires, but can also mitigate their onset and effects. Forest and grassland areas can be cleared of dry fuel to prevent fires from starting and can be burned proactively to prevent uncontrolled burning.

4.3.10.2 Wildfire History in Washington County

There have been no recently recorded wildfires or damages from wildfires reported in Washington County.

4.3.10.3 Geographic Location for Wildfire

Wildfires can affect any area of the county that may be experiencing a drought.

4.3.10.4 Hazard Extent for Wildfire

Wildfires can be widespread or localized events.

4.3.10.5 Risk Identification for Wildfire

In Meeting #2, the planning team determined that the probability of a wildfire is possible with limited consequences. The warning time for a wildfire is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for wildfire is 2.3.

4.3.10.6 Vulnerability Analysis for Wildfire

Residential, commercial and recreational areas are all vulnerable to wildfires. Areas of concentrated vegetation such as national parks or forests can be exceptionally vulnerable to wildfire.

4.3.10.7 Community Development Trends and Future Vulnerability

Because wildfire hazard events may occur anywhere within the county, future development will be impacted. Major future development areas will be supplied with water distribution, including hydrants for fire protection.

4.3.10.8 Relationship to other Hazards

Flooding and Erosion – Wildfires can completely eliminate vegetation and pose an increased risk to flooding and erosion effects.

Drought and Extreme Heat – Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Hazardous Material Release – Storage tanks carrying chemicals including chlorine, anhydrous ammonia, and fuel tanks located at farms pose an increased risk to wildfire ignition.

4.3.11 Infectious Agents or Harmful Organisms

4.3.11.1 Hazard Definition for Infectious Agents or Harmful Organisms

The spread of harmful organisms and infectious agents are occasionally overlooked, potential natural hazards that can be exacerbated following other natural disasters. This hazard can include invasive species, such as the Emerald ash borer, or vector-borne diseases, such as West Nile fever.

Emerald Ash Borer

The Emerald ash borer (EAB), Agrilus planipennis, is an exotic beetle thought to have arrived in the United States by 2002 and was discovered near Detroit, Michigan. Indiana was one of the next states recognized to have the beetle, having been discovered in northern Indiana in 2004.

The adult beetles do not pose harm to the ash trees, as they nibble on ash foliage. The immature, or larvae stage, feed on the inner bark of the ash trees, disrupting its ability to transport nutrients and water. The EAB is responsible for killing millions of ash trees in North America. It has cost municipalities, property owners, nursery owners, and forest industries millions of dollars.

Vector-Borne Illness

Vector-borne diseases are caused by infectious microorganisms that are transmitted to people via living organisms including blood-sucking arthropods such as mosquitos, ticks, fleas, and spiders. Natural disasters, particularly meteorological events such as cyclones, hurricanes, and flooding, can influence transmission of vector-borne disease. The crowding of infected and vulnerable hosts, a debilitated public health infrastructure, and disruptions of ongoing control processes are risk factors for transmission of vector-borne disease. The Indiana State Department of Health (ISDH) identifies sleeping sickness (Eastern equine encephalitis virus), La Crosse encephalitis (La Crosse virus), St. Louis encephalitis (St. Louis encephalitis virus), West Nile fever (West Nile virus), and dengue fever (dengue virus), as mosquito-borne diseases that Hoosiers should take steps to protect themselves against.

The health department has also reported more than 200 cases of tick-borne illness in Indiana in 2016 alone. The ISDH highlighted Lyme disease, Rocky Mountain spotted fever, and Erlichiosis as tick-borne diseases particularly prevalent in Indiana. Over the past few years, Indiana has experienced a rise in tick-borne Lyme disease. There were approximately 100 confirmed cases of Lyme disease in 2014, but only 26 cases in 2006. Increased summer tick populations frequently follow mild winters, and back-to-back mild winters can cause a notable surge in tick numbers, along with the diseases they carry. In June of 2017, a young Indiana girl died after contracting Rocky Mountain spotted fever from a tick bite. Recently, a new tick-transmitted virus has made headlines through the state. The Centers for Disease Control confirmed two cases of Heartland virus in Indiana. Both infected patients survived.

4.3.11.2 Infectious Agents or Harmful Organisms History in Washington County

Emerald Ash Borer

EAB has been detected in Washington County, Indiana. As of 2017, the entire state of Indiana lies within the Federal quarantine boundaries and Washington County lies within the state-quarantined area.

Vector-Borne Illness

Mosquitoes carrying West Nile virus have been found in Washington County. Most people who get infected with West Nile virus will have either no symptoms or mild symptoms, but a few individuals may contract a more severe form of the disease.

4.3.11.3 Geographic Location for Infectious Agents or Harmful Organisms

Emerald Ash Borers are most commonly found in forested areas but can also negatively impact neighborhoods or any other areas that have trees.

Mosquitos are drawn to areas of standing water and are commonly most active at dusk and dawn; however, all areas are affected by mosquito populations.

4.3.11.4 Hazard Extent for Infectious Agents or Harmful Organisms

An exposure analysis identifies the existing and future assets located in identified hazard areas. The areas with reported identification of the EAB in Washington County are identified in Figure 52 with magenta dots. The points shown are collected from DNR annual surveys and from the DNR Division of Entomology and Plant Pathology field staff. According to the Department of Natural Resources, a live larva must be collected from an ash tree and identified by a trained specialist in order to confirm the presence of EAB at the marked location. There may be more locations with EAB that have not been identified.

Figure 52. Emerald Ash Borer in Washington County (Map courtesy of IDNR)

4.3.11.5 Risk Identification for Infectious Agents or Harmful Organisms

In Meeting #2, the planning team determined that the probability of an infectious agent or harmful organism hazard as possible with limited consequences. The warning time for an infectious agent or harmful organism hazard is about 6 to 12 hours with a duration of more than 1 week. The calculated CPRI for harmful organisms is 2.35.

4.3.11.6 Vulnerability Analysis for Infectious Agents or Harmful Organisms Hazard

All communities can be potentially at risk for an epidemic and experience increased risk during hazards the cause displacement, contamination of the water supply, and/or deprivation of essential utilities, or when residents are not exposed to educational resources outlining preventive steps.

4.3.11.7 Community Development Trends and Future Vulnerability

Future development will remain vulnerable to these events. EABs have killed millions of ash trees in Indiana, Michigan, Illinois, Ohio, and Ontario and will continue to do so until the insects are effectively contained or eliminated or a strain of more resistant trees is developed.

According to the National Institute of Allergy and Infectious Diseases, tick-borne illnesses will continue to remain a problem as people build homes in wilderness areas where ticks and their animal hosts live; however, urban environments can also host ticks and the pathogens they can transmit.

Eliminating areas of standing water may help diminish the disease-carrying mosquito population by removing or treating stagnant bodies of water areas that serve as mosquitos' breeding grounds.

4.3.11.8 Relationship to other Hazards

The risk for infectious disease transmission is primarily associated with displacement and the characteristics of the displaced population, the proximity of sterile water and function restrooms, the nutritional status of the displaced, the level of immunity to vaccine-preventable infections, and the availability of access to healthcare services.

Flooding – Increased risk of vector-borne diseases. EAB-damaged trees may pose a risk for increased logjam events. In the aftermath of flooding, a plethora of standing water combined with a possibly weakened health infrastructure and an interruption of ongoing control programs increases the risk factors for vector-borne disease transmission. While initial flooding may wash away existing mosquito-breeding sites, standing water caused by heavy rainfall or overflow of rivers can create new breeding sites.

Earthquake – In the aftermath of earthquakes, some populations have experienced infection outbreaks associated with increased exposure to airborne dust from landslides.

Tornadoes – Natural disasters like tornadoes, which impact communities on a large-scale and cause displacement, have been associated with an increased risk in disease.

Utility Failure – Power outages and the disruption of water treatment and supply plants can affect the proper functioning of health facilities and has also been linked with an increase in diarrheal illness.

5 Mitigation Goals and Strategies

The goal of mitigation is to protect lives and build disaster-resistant communities through minimizing disruptions to local and regional economies, reducing the future impacts of hazards including property damage, and supporting best use practices for public and private funds spent on recovery assistance. This chapter discusses the general mitigation vision and mitigation goals to reduce or avoid long-term vulnerabilities to the hazards identified in the proceeding chapter. Successful mitigation actions and projects are based on well-constructed risk assessments, which are provided in Chapter 4.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of county capabilities to determine whether the activities may be improved to more effectively reduce the impact of future hazards. The following sections highlight the existing plans and mitigation capabilities within all of the communities.

5.1.1 Planning and Regulatory

Planning and regulatory capabilities include the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. In the following subsection, the team details the NFIP program and local plans, codes, and ordinances in place that serve to make the county more resilient to disasters.

5.1.1.1 National Flood Insurance Program (NFIP)

According to FEMA, the NFIP is a federal program created by Congress to mitigate future flood losses nationwide through community-enforced building and zoning ordinances and to allow access to affordable, federally-backed flood insurance protection for property owners. Providing an insurance alternative to disaster assistance, the NFIP is designed to alleviate the escalating costs of repairing flood damage to buildings and their contents. If communities participate in the NFIP through adopting and enforcing a floodplain management ordinance to reduce future flood risks to new construction in SFHAs, the federal government has agreed to make flood insurance available within the community as a financial protection against flood losses. In order to remain eligible for future mitigation funds, NFIP communities must adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP.

Washington County and the City of Salem participate in the NFIP. The total number of policies, written premiums in-force, and coverage of insurance in-force are identified in the following table.

Table 32. NFIP Policies and Coverage

NFIP Community	Total Number of Policies	Insurance In-force whole	Written Premium in-force
Washington County	27	$715,200	$8,585
City of Salem	13	$1,627,600	$20,840

In order to assure coverage is available for all policy holders, the county and its NFIP communities will assure the continued compliance of the state floodway and NFIP requirements.

The Indiana Flood Control Act grants the IDNR regulatory control over floodway areas in any state waterway (streams less than 1 square mile in drainage area). Within the Flood Control Act, the General Assembly created a permitting program. Two of the fundamental provisions of the Act's regulatory programs consist of the following:

1. An abode or place of residence may not be constructed or placed within a floodway.
2. Any structure, obstruction, deposit, or excavation within a floodway must receive written approval from the Director of the Department of Natural Resources for the work before beginning construction.

The DNR is the Cooperating Technical Partner for the FEMA Floodplain Mapping program and provides floodway site determinations upon request. The DNR performs both the Community Assistance Call (CAC) and Community Assistance Visit (CAV) for the NFIP program. The CAV and CAC serve as each NFIP communities' assurance that the community is adequately enforcing its floodplain management regulations and prices opportunities for technical assistance by the DNR on behalf of FEMA.

The NFIP's Community Rating System (CRS) recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. Depending upon the level of participation, flood insurance premium rates for policyholders can be reduced. Besides the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Technical assistance on designing and implementing some activities is available at no charge. Participating in the CRS provides an incentive to maintaining and improving a community's floodplain management program over the years. Neither Washington County nor any of the jurisdictions participate in the CRS program.

5.1.1.2 Plans and Ordinances

Washington County and its incorporated communities have a number of plans and ordinances in place to ensure the safety of residents and the effective operation of communities. These include the Soil Survey of Washington County, Washington County Comprehensive Plan, and the Washington County Land Use & Development Code- Zoning Ordinance. Information was collected through surveys with plan team representatives of the county, cities, and towns. The

results of these surveys can be found in Appendix F. The review of this information was used to inform the development of mitigation strategies for the 2017 plan update.

Table 33. Jurisdictions Planning Mechanisms

Capabilities	Washington County	Salem	Campbellsburg	Livonia	New Pekin
Comprehensive Plan	2010	2010	2007	-	2012
Emergency Operations Plan	2018	2018	2018	2018	2018
Watershed Plan	-	-	-	-	-
Resilience Report					
Zoning Ordinance	2016	2015	-	-	-
Building Codes/ Ordinance	1985	2005		-	-
Floodplain Ordinance	2013	2017	-	-	-
Storm Water Ordinance	-	2018	2018	-	2012
Erosion Ordinance	State Erosion Control Rule 5 (327 IAC 15-5)	1990	State Erosion Control Rule 5 (327 IAC 15-5)		
Burning Ordinance	State	State	State	State	State

Note: The floodplain ordinance date is based upon the currently effective map date provided by the FEMA status book report for Communities Participating in the National Flood Program.

Many of these plans or policies can help implement the goals, objectives and strategies in Washington County's MHMP. The Washington County Emergency Management Director is responsible for meeting within each jurisdiction yearly throughout the next five years. During these meetings, the local Emergency Management Director will review all Local Planning Mechanisms and collaborate with the Cities and Towns to ensure the MHMP is becoming as integrated into local plans as possible. These Local Planning Mechanisms are meant to work cooperatively together in order to ensure the health, safety, and welfare of Washington County and its corresponding jurisdictions. Although only one of the planning mechanisms has been updated since the initial hazard mitigation plan was adopted city, town, and county officials will integrate related plans with hazard mitigation goals, objectives, and strategies when feasible and appropriate.

5.2 General Mitigation Goals

In Section 4.0 of this plan, the risk assessment identified a number of natural hazards that Washington County experiences. The MHMP planning team members understand that although hazards cannot be eliminated altogether, Washington County can work toward building

disaster-resistant communities. Following are a list of goals, objectives, and actions identified in the previous Washington County MHMP. These goals remain valid and represent long-term, broad visions of the overall vision the county would like to achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

Goal 1: Lessen the impacts of hazards to new and existing infrastructure

- Objective (a): Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.
- Objective (b): Equip public facilities and communities to guard against damage caused by secondary effects of hazards.
- Objective (c): Minimize the amount of infrastructure exposed to hazards.
- Objective (d): Evaluate and strengthen the communication and transportation abilities of emergency services throughout the community.
- Objective (e): Improve emergency sheltering in the community.

Goal 2: Create new or revise existing plans/maps for the community

- Objective (a): Support compliance with the NFIP.
- Objective (b): Review and update existing, or create new, community plans and ordinances to support hazard mitigation.
- Objective (c): Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate community residents on the hazards affecting their county

- Objective (a): Raise public awareness on hazard mitigation.
- Objective (b): Improve education and training of emergency personnel and public officials.

5.3 Mitigation Actions and Projects

Upon completion of the risk assessment and development of the goals and objectives, the planning committee was provided a list of the six mitigation measure categories from the FEMA State and Local Mitigation Planning How to Guides. The types of mitigation actions are listed as follows:

- **Prevention**: Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples

include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services**: Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects**: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is important. The plan team assessed the status and priority of the existing strategies using the FEMA mitigation evaluation criteria using the STAPLE + E criteria. Table 34 lists the factors to consider in the analysis and prioritization of actions. Some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action.

Table 34. STAPLE+E Criteria

Criteria	Description
S – Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E – Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Understanding the dynamics of STAPLE + E lead to the project's success. Developing questions evolving around the evaluation criteria, similar to those outlined below, help the team prioritize the projects.

Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political:

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal:

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic:

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be "tabled" for implementation until outside sources of funding are available?

Environmental:

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

5.3.1 Hazard Mitigation Actions

Washington County and its included municipalities share a common Hazard Mitigation plan and worked closely to develop it. These communities work together with their city councils and the Washington County Emergency Management Director to insure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions. The jurisdictions responsible for each action consist of the following:

- Washington County
- Salem
- Campbellsburg
- Livonia
- New Pekin

lists all mitigation actions for Washington County and its jurisdictions. Each of these mitigation action charts detail the hazard, the mitigation action to address the identified hazard, its current stage of implementation, the timeframe for implementation going forward, the jurisdictions who have identified they will work to implement the action, the responsible parties to carry through with implementation, and comments on how the plan will be implemented through existing planning mechanisms and funding to make implementation happen.

Additionally, the Washington County planning team assigned the mitigation actions priority rankings for implementation (1=High Priority; 2= Moderate Priority; 3= Low Priority). Mitigation actions given a "high" priority ranking will ideally be implemented within 5 years of the MHMP plan adoption date. Mitigation actions ranked as a "medium" priority may be addressed within

5-10 years from the MHMP plan adoption date, and "low" priority mitigation actions may take over 10 years before action completion. Although higher ranking priorities may constitute a greater county concern than lower ranking priorities, the availability of funds may cause some mitigation actions to take longer to implement.

All of the mitigation actions identified in the 2013 Washington County Hazard Mitigation Plan have been carried over into the 2018 plan based on the advisement of the Washington County Emergency Management Director and the consensus of the steering committee. Not all of the 2013 mitigation actions have been fully completed, and they are identified in the 2018 plan to reflect their ongoing implementation.

The status designations include the following:

- **Identified** – actions are in the preliminary stages and have not yet started
- **Complete** – the action is complete
- **Ongoing** – actions require continuing application
- **In Progress** – actions are currently being acted upon
- **Deferred** – no progress has been made
- **Deleted** – the action is no longer relevant

The mitigation action types encompass the following areas:

- **Prevention** – expand mapping, loss-prevention programs, buyouts, regulations
- **Property Protection** – identify vulnerable areas and populations, retrofit vulnerable buildings, structural improvement
- **Public Education** – information sessions, presentations, disclosure, website information, brochures, educational resources, and hazard awareness
- **Natural Resource Protection** – conservation, erosion control, stream corridor restoration, wetland restoration, resource management
- **Emergency Services** – emergency alerts, evacuation plans, expand emergency operations
- **Structural Improvement** – acquisitions and elevations of structures in flood prone areas, structural retrofits, retaining walls, retention structures, culverts, and safe rooms.

5.3.2 Mitigation Actions by Community

This is a multi-jurisdictional plan that covers Washington County, its school districts, and those communities who have participated in the update process. The Washington County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan.

Table 35. Mitigation Actions

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
1	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Hazmat, Subsidence, Fire	Emergency Services	Goal: Develop plans and strategies to protect citizens and build community resiliency. Objective: Develop plans to assist special needs populations.	Establish shelters as compliant with the Americans with Disabilities Act (ADA).	All	Complete		County EMA, American Red Cross	Not Applicable	2014 MHMP
2	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Hazmat, Subsidence, Fire	Emergency Services	Goal: Create new or revise existing plans/maps for Washington County. Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Identify and review evacuation routes for schools and the community.	All	Complete		County EMA, local schools	Not applicable	2014 MHMP
3	Tornado, Summer Storm	Property Protection	Goal: Create new or revise existing plans/maps for Washington County. Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Develop ordinance requiring mobile homes to have tie-downs.	Washington County	Complete		County EMA	FEMA	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
4	Subsidence	Prevention	Goal: Create new or revise existing plans/maps for Washington County. Objective: Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Identify karst areas.	All	Complete		Indiana Geological Survey	Indiana Geological Survey	2014 MHMP
5	Tornado, Flood, Dam/Levee, Earthquake, Tstm, Winter Storm, Hazmat, Subsidence, Fire	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Improve emergency sheltering in the community.	Establish temporary shelters.	All	Ongoing	High	County EMA, American Red Cross	FEMA	2014 MHMP
6	Tornado, Summer Storm, Winter Storm	Emergency Services	Goal: Develop plans and strategies to protect citizens and build community resiliency. Objective: Empower citizens to protect themselves and their homes from potential disasters.	Distribute weather radios.	All	Ongoing	High	County EMA	FEMA, IDHS	2014 MHMP
7	Tornado, Flood, Dam/Levee, Earthquake, Tstm, Winter	Emergency Services	Goal: Develop plans and strategies to protect citizens	Maintain plan that identifies special needs population and provide	All	Ongoing	Medium	County EMA, County Health Dept	American Red Cross (for supplies)	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
	Storm, Drought, Hazmat, Subsidence, Fire		and build community resiliency. Objective: Develop plans to assist special needs populations.	emergency distribution of food/water/medical supplies.						
8	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Subsidence, Fire	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Establish Reverse 911 system.	All	Ongoing	High	County EMA, National Weather Service	County	2014 MHMP
9	Hazmat, Fire	Property Protection	Goal: Create new or revise existing plans/maps for Washington County. Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Establish and enforce burning ordinances.	Salem, New Pekin	Complete		County commissioners, city councils, town boards	Not applicable	2014 MHMP
10	Flood	Prevention	Goal: Lessen the impacts of hazards to new and existing infrastructure.	Implement projects to promote flood control, including cleaning log jams.	All	Ongoing	High	City of Salem	Community Development Block Grant (HUD)	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
			Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards							
11	Flood	Prevention	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards	Implement storm drainage projects.	All	Ongoing	High	County Stormwater Management	HUD, USACE, IDEM, IDNR, IDHS, FEMA	2014 MHMP
12	Tornado, Flood, Earthquake, Tstm, Winter Storm	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.	Procure additional permanent fixed and portable generators and/or transfer switches.	All	Ongoing	High	County EMA, County Commissioners, School Corporations	FEMA	2014 MHMP
13	Flood	Prevention	Goal: Create new or revise existing plans/maps for Washington County.	Develop Flood Mitigation Strategy.	Washington County	Identified	High	County	FEMA	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
			Objective: Conduct new studies/research to profile hazards and follow up with mitigation strategies.							
14	Flood, Dam/Levee	Prevention	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Minimize the amount of infrastructure exposed to hazards.	Continue road improvement projects in flood-prone areas.	All	Ongoing	High	County Highway Dept, INDOT	INDOT, FEMA, IDHS	2014 MHMP
15	Tornado, Summer Storm	Emergency Services	Goal: Develop plans and strategies to protect citizens and build community resiliency. Objective: Empower citizens to protect themselves and their homes from potential disasters.	Procure additional warning sirens.	All	Identified	Medium	County EMA, National Weather Service	FEMA	2014 MHMP
16	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Hazmat, Subsidence, Fire	Public Education	Goal: Develop long-term strategies to educate Washington County residents on the hazards affecting their county.	Maintain marketing materials to educate public on preparedness and survival and distribute to the public, such as at the county fair.	All	Ongoing	Low	County EMA	FEMA, IDHS	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
			Objective: Raise public awareness on hazard mitigation.							
17	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Hazmat, Subsidence, Fire	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Minimize the amount of infrastructure exposed to hazards.	Establish an alternate EOC in case main EOC cannot be used.	All	Complete		County EMA	FEMA, HUD, OCRA, community grants	2014 MHMP
18	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Hazmat, Subsidence, Fire	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Add four channels to repeater (functional portable tower with generator for sheriff, fire, secondary EMS and city police).	All	Ongoing	Medium	County EMA	OCRA	2014 MHMP
19	Earthquake, Subsidence	Property Prevention	Goal: Develop plans and strategies to protect citizens and build community resiliency. Objective: Develop plans to assist special needs populations.	Continue partnership with the Red Cross to distribute smoke alarms to special needs populations.	All	Ongoing	Medium	County EMA, County Health Dept, Red Cross	FEMA	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
20	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Hazmat, Subsidence, Fire	Emergency Services	Goal: Develop long-term strategies to educate Washington County residents on the hazards affecting their county. Objective: Improve education and training of emergency personnel and public officials.	Improve fire fighting capability throughout the county, including updating equipment.	Washington County	Ongoing	Medium	County EMA, individual fire departments	HUD	2014 MHMP
21	Earthquake, Subsidence	Property Prevention	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards	Procure anchors to brace large propane tanks. The county should also establish an ordinance requiring these anchors.	All	Ongoing	Medium	County EMA	FEMA	2014 MHMP
22	Earthquake, Subsidence	Property Prevention	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards	Harden existing critical facilities (fire stations and schools).	All	Identified	Medium	County EMA	FEMA	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
23	Earthquake, Subsidence	Public Education	Goal: Develop long-term strategies to educate Washington County residents on the hazards affecting their county. Objective: Raise public awareness on hazard mitigation.	Conduct community education and outreach for those with natural gas. Educate public on importance of inertial gas shut-off valves.	All	Identified	Low	County EMA	FEMA, IDHS, Utilities (Midwest Natural Gas)	2014 MHMP
24	Winter storm	Natural Resource Protection	Goal: Create new or revise existing plans/maps for Washington County. Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Annual reevaluation of snow removal plan prior to every winter.	All	Ongoin	Medium	County EMA, County Commissioner, County Highway	Not applicable	2014 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
25	Tornado, Flood, Dam/Levee, Earthquake, Summer Storm, Winter Storm, Drought, Hazmat, Subsidence, Fire	Emergency Services	Goal: Lessen the impacts of hazards to new and existing infrastructure. Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Procure additional medical and response equipment.	All	Ongoing	Low	County EMA, County EMS	Community grants	2014 MHMP
26	Flood	Property Protection	Goal: Create new or revise existing plans/maps for Washington County. Objective: Support compliance with the NFIP for each jurisdiction in Washington County.	Encourage non-participating communities to join the NFIP (Little York, New Pekin).	Campbellsburg, Hardinsburg, Little York, Livonia, New Pekin, Saltillo	Identified	Low	County EMA	FEMA, IDNR	2014 MHMP
27	Flood	Prevention		Flood Study of Brock Creek and tributaries	Salem, City Of; Washington County	Identified	Low	Building Code Department	NRCS	RiskMAP Process
28	Multiple Hazards	Prevention		Implement Zoning	Washington County	In Progress	High	Planning	General Funds	Other
29	Flood	Prevention		Increase Building Restrictions Along Streams	Salem, City Of	Identified	Low	Building Code Department	Other	RiskMAP Process
30	Multiple Hazards	Public Education		Increase Effectiveness of Post-Disaster Recovery Efforts through Public Outreach	Washington County	Identified	Low	Emergency Management	Other	RiskMAP Process

#	Hazards Addressed	Mitigation Action Type	Goals and Objects Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
31	Flood	Prevention		Henry Creek Stream Maintenance	Washington County	Identified	Low	Other	Other	RiskMAP Process
32	Flood	Structural Improvement		High Street Bridge Improvements	Salem, City Of	Identified	Low	Other		RiskMAP Process
33	Flood	Property Prevention		Relocation of Water Street businesses	Salem, City Of	Identified	Low	Building Code Department	FMA	RiskMAP Process
34	Erosion	Property Prevention		Salem Community School erosion control	Salem, City Of	Identified	Low	Public Works		RiskMAP Process
35	Multiple Hazards	Emergency Services		Identify and building safe rooms/storm shelters	All	Ongoing	High	County Emergency Management, School Districts	IDHS, FEMA	RiskMAP Process
36	Flood	Prevention		School Road ditch improvements	County	Identified	Low	Other	General Funds	RiskMAP Process
37	Flood	Prevention		Reduce Flood Risk at Overtopped Roads	Washinton County	Identified	Low	Emergency Management	Other	RiskMAP Process
38	Multiple Hazards	Emergency Services		Improve Shelter Capabilities (Add Generators Hookups)	Washinton County	Identified	Low	Emergency Management	Other	RiskMAP Process

6 Chapter 6 – Plan Maintenance and Implementation

6.1 Implementation and Maintenance

The Washington County MHMP is intended to serve as a guide for dealing with the impact of both current and future hazards for all people and institutions within the jurisdiction. As such it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives and mitigation strategies will serve as the action plan. Even though individual strategies have a responsible party assigned to it to ensure implementation, overall responsibility, oversight, and general monitoring of the action plan has been assigned to the Washington County Emergency Management Director.

Goals identified by the county will be addressed by the County Commission and the Town and City Councils will be responsible for implementing their corresponding strategies.

It will be the community's responsibility to gather a Local Task Force to update the Multi-Hazard Mitigation Plan on a routine basis. Every year, the County Emergency Management Director will call a meeting to review the plan, mitigation strategies and the estimated costs attached to each strategy. All participating parties of the original Local Task Force and cities will be invited to this meeting. Responsible parties will report on the status of their projects. It will be the responsibility of the committee to evaluate the plan to determine whether:

- Goals and objectives are relevant.
- Risks have changed.
- Resources are adequate or appropriate.
- The plan as written has implementation problems or issues.
- Strategies have happened as expected.
- Partners participating in the plan need to change (new and old).
- Strategies are effective.
- Any changes have taken place that may affect priorities.
- Any strategies should be changed.

In addition to the information generated at the Local Task Force (LEPC and CEMP) meetings, the County Emergency Management Director will also annually evaluate the Multi-Hazard Mitigation Plan and update the plan in the event of a hazardous occurrence. After the fourth annual update meeting, the Washington County Emergency Management Director will finalize a new Local Task Force to begin the required five-year update process. This will be accomplished in coordination with Washington County jurisdictions and the entire Multi-Hazard Mitigation Plan shall be updated and submitted to FEMA for approval (within 5 years of plan adoption). These revisions will include public participation by requiring a public hearing and published notice in addition to multiple Local Task Force meetings to make detailed updates to the plan.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing will be duplicated for any future update processes – direct mailing list of interested parties, public meetings, press releases, surveys, questionnaires, and resolutions of participation and involvement. Additional methods of getting public input and involvement are encouraged, such as placing copies of the plan in the Washington County Emergency Management Director's office and the offices of the participating incorporated communities in addition to placing the plan on the Washington County and social media websites. Furthermore, jurisdictions will be encouraged to place a notice on their websites stating the plan is available for review at the city offices. Notifications of these methods could be placed in chamber newsletters and local newspapers. Committee responsibilities will be the same as with updates.

Chapters 5 focuses on mitigation strategies for natural hazards and jurisdiction-specific mitigation strategies for both natural and man-made/technological hazards. The Multi-Hazard Mitigation Plan proposes a number of strategies, some of which will require outside funding in order to implement. If outside funding is not available, the strategy will be set aside until sources of funding can be identified. In these situations, Washington County and cities will also consider other funding options such as the county's/cities'/towns' general funds, bonding and other sources. Based on the availability of funds and the risk assessment of that hazard, the county will determine which strategies should be continued and which should be set aside. Consequently, the action plan and the risk assessment serves as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources.

The last step requires an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying who is responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Washington County and its jurisdictions have incorporated the preferred strategies including identification of the responsible party to implement, the timeframe and the cost of the activity with the goals and policies framework.

6.2 Local Plan Integration

The Hazard Mitigation Planning Team and the Local Task Force members shall recognize this document as an important planning tool for their communities and will recommend its use as a reference as their communities complete other related plans. The county Emergency Management Director will contact the Washington County Community Development Executive Director and the City of Template Department of Development & Redevelopment Director to ensure they will use this plan as they update their Comprehensive Plan as well as any other relevant community ordinances such as zoning, floodplain, capital improvement plans, etc. The county Emergency Management Director shall also contact the head of other departments as they work other stand-alone plans that might relate to this one or its strategies such as those for park and recreation, sustainability, etc. As each planning mechanism is updated, the Local

Task Force will reevaluate the status of the mitigation strategies and determine whether any changes in them is needed.

The Emergency Management Advisory Council (EMAC) will continue to serve as the advisory body that provides general supervision and control over the emergency management and the disaster programs for the county and its multiple jurisdictions. The quarterly meetings will continue to be available to the public and other mitigation team members through the EMAC and other mitigation projects avenues such as RiskMAP.

Since the adoption of the last Hazard Mitigation Plan, multiple flood, storm water and flood ordinances have been updated in the county. Both flooding ordinances, Washington's County (2013) & City of Salem(2018), are modeled after the Indiana model ordinance for flood hazard areas, which recognizes multiple zones related to a 100-year flood event, and limits development in them.

6.3 Adoption, Implementation and Maintenance

6.3.1 County Adoption

One of the first steps in implementing the plan is to make sure that it is officially adopted in a public hearing. The task force and public provided comment on the draft plan. The task force reviewed comments, modifications were made and a final draft was sent to FEMA for review, comment and approval. After FEMA approved the plan, the county board adopted the plan. A public hearing was held to obtain any additional comments that the public or others wished to make. A copy of the county and the community jurisdictions resolutions to adopt are located in Appendix G.

6.3.2 City and Town Adoption

The Multi-Hazard Mitigation Plan for Washington County is a multijurisdictional plan. All communities in the county – towns and cities – were involved in the various stages of the planning process and a mitigation strategies have been identified for each jurisdiction. Each of Washington County's cities and towns passed resolutions to participate in the county plan. Following official adoption of the plan by the county each city and township was notified. Each chose whether or not to adopt the plan as well. Each were encouraged to adopt enabling them to apply for HMGP funds independently not under the umbrella of the county. Copies of the city and towns resolutions choosing to adopt the plan are in Appendix G.

6.3.3 Implementation and Maintenance Guidelines.

The Washington County Multi-Hazard Mitigation Plan is intended to serve as a guide/reference to mitigate the impact of both current and future hazards for all county residents and institutions. As such, it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives and mitigation strategies will

serve as a work or action plan. Individual strategies have a party assigned to it to help ensure implementation, oversight and general monitoring of the action plan; however, oversight has been assigned to the County Emergency Manager. The following guidelines will help implement the goals, objectives and strategies of the plan. An implementation committee will be used to assist in this process. The existing task force, the planning commission, other appropriate county committee, or any other group of stakeholders could serve as the implementation committee to review implementation opportunities identified in the plan. Implementation of strategies should be a collaborative effort of the participating jurisdictions. This committee should operate by group consensus and create recommendations for implementation to bring forward to the proper governing entity for consideration. Guidelines for the committee include:

1. Commitment to the plan and overall mitigation vision.
2. Protect sensitive information.
3. Take inventory of strategies in progress.
4. Determine strategies that no longer are needed or new strategies that have emerged.
5. Set priorities. Assign responsibilities to complete.
6. Seek funding.
7. Meet minimum bi-annually – one meeting to set the course of action and a second to monitor progress.
8. Report to all respective boards for action.
9. Advisory capacity.

Assigning strategies and implementation activities in this plan to certain entities does not guarantee completion. The strategies and activities addressed in this plan will be addressed as funding and other resources become available and approval by the responsible jurisdiction takes place.

The County Emergency Manager has the overall responsibility of tracking the progress of mitigation strategies. The County Emergency Manager will request updates from responsible agencies and cities on their mitigation actions after each disaster and at least annual to coincide with plan evaluation. Post disaster monitoring will evaluate the effectiveness of mitigation actions that have been completed and determine implementation of planned strategies. Monitoring may lead to developing a project that may be funded by FEMA's Hazard Mitigation Assistance Programs.

6.3.3.1 Continued Public Involvement

Annual reviews to change the plan will be led by the County Emergency Manager using the implementation committee. It will be their responsibility to review the plan and mitigation. FEMA strongly encourages annual reviews of the planning documents on the anniversary of the plan approval. Responsible parties and the implementation committee will report on the status of their projects. Committee responsibility will be to evaluate the plan to determine whether:

- Goals, objectives and strategies are relevant.
- Risks that have changed including the nature, magnitude, and/or type of risks.
- Resources are adequate or appropriate.
- The plan as written has any implementation problems or issues.
- Deadlines are being met as expected.
- Partners participating in the plan are appropriate.
- Strategies are effective.
- New developments affecting priorities.
- Strategies that should be changed.

Updates every five years are led by the County Emergency Management Agency Director in coordination with incorporated communities to complete a rewrite for submitting to FEMA. A task force, similar to the one created to complete the plan, will be formed and used in the planning process to rewrite the plan. These revisions will include public participation by requiring a public hearing and published notice. Future updates should address potential dollar losses to vulnerable structures identified. Any major changes in the plan may include additional public meetings besides just a public hearing.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing should be duplicated for any updates – direct mailing list of interested parties, public meetings, press releases, surveys, questionnaires, and resolutions of participation and involvement. Additional methods of getting the public input and involvement are encouraged such as placing copies of the plan in public libraries for public comment or placing the plan on county and city websites. Notifications of these methods could be placed in newsletters and the local newspapers. Committee responsibilities will be the same with updates as the original plan.

The action plan proposes a number of strategies, some of which will require outside funding to implement. If outside funding is not available, the strategy may be set aside until sources of funding can be identified or modified to work within the funding restrictions. In these situations, the county and entities will also consider other funding options such as the county's general fund, bonding and other sources. Based on the availability of funds and the risk assessment of the hazard, the county will determine which strategies should they continue to work on and which should be set aside. Consequently, the action plan and the risk assessment serves as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources. It is not a legal binding document.

Updates require an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying who is responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Washington County has incorporated the preferred strategies including

identification of the responsible party to implement, the timeframe and the cost of the activity in the plan framework.

This plan will be integrated into other county plans such as the County Comprehensive Plan, the County Water Plan, the County Transportation Plan, and all Emergency Operations Plans. Chapter one can serve as an executive summary to be attached to those plans as necessary. The County Board encourages jurisdictions to address hazards in their comprehensive plans, land use regulations, zoning ordinances, capital improvement and/or building codes by including some of the mitigation strategies in their plans. Many of the plans or policies can include strategies from the Hazard Mitigation Plan. They are meant to blend and complement each other so that strategies are duplicated and occur in different plans as appropriate.

Bibliography & Quick Reference

References are separated from the county specific resources. The Quick Reference is a guide to the federal & state programs discussed within the plan.

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County Specific Resources

Quick Reference State & Federal Programs

State Resources

All Agency, Indiana Drainage Handbook: http://www.in.gov/dnr/water/4893.htm

DNR, NFIP and Floodplain management resources: floodmaps.in.gov

DNR, lake and river construction regulations: http://www.in.gov/dnr/water/4963.htm

DNR authority under the Flood Control Act is further described: 312 IAC 10: Floodplain Management

DNR, LARE resource: “LARE Project Reports.” http://www.in.gov/dnr/fishwild/3303.htm

DNR, SHAARD: “SHAARD Database.” http://www.in.gov/dnr/historic/4505.htm

DNR, State historical county survey: http://www.in.gov/dnr/historic/2824.htm

DNR, Invasive Species, Gypsy Moth and EAB: http://www.in.gov/dnr/3123.htm to report, call: (317) 232-412

Evaluating Earthquake Losses due to Ground Failure and Identifying their Relative Contribution can be accessed through the following link: http://www.iitk.ac.in/nicee/wcee/article/13_3156.pdf.

IDEM, State Rule 5, Land Management: http://www.in.gov/idem/permits/water/wastewater/wetwthr/storm/rule5.html

IDEM, Meth Cleanup Information: http://www.in.gov/idem/health/2385.htm

IDNR, Water Shortage Plan: https://www.in.gov/dnr/water/files/watshplan.pdf

Indiana State Police, Meth Resources: https://socratadata.iot.in.gov/Government/ISP-Meth-Lab-Locations-Map/ktyc-iiu7

Indiana State Department of Health, HIV Outbreak: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

INDOT, Traffic Wise, Real-time traffic Conditions: http://pws.trafficwise.org/pws/

INDOT, Preservation Initiative: http://www.in.gov/indot/3371.htm

Purdue, Invasive Species, EAB Resources: https://extension.entm.purdue.edu/EAB/

Federal Resources

EPA, Local Emergency Planning Committees: https://www.epa.gov/epcra/energize-your-local-emergency-planning-committees-lepc

EPA, Excessive Heat Events Guidebook: https://www.epa.gov/heat-islands/excessive-heat-events-guidebook

ESRI Map: https://www.arcgis.com/apps/PublicInformation/index.html?appid=4ae7c683b9574856a3d3b7f75162b3f4

Extreme Heat: https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2014.pdf

FEMA Training Guide: https://training.fema.gov/emiweb/is/is393a/is393.a-lesson4.pdf

FEMA, Commuter Emergency Plans: http://www.fema.gov/media-library/assets/documents/90370

FEMA, Safe Room Guidance: https://www.fema.gov/media-library/assets/documents/3140

FEMA, Local Mitigation Planning Handbook: https://www.fema.gov/media-library/assets/documents/31598

US Fish and Wildlife, endangered and threatened species: https://www.fws.gov/midwest/endangered/saving/outreach.html

US Fish and Wildlife, Bat Children Resources:

https://www.fws.gov/midwest/endangered/mammals/inba/curriculum/InbaKidsCavesOhMy.pdf

USGS, FIM maps: http://water.usgs.gov/osw/flood_inundation/

USGS, NHD Data: https://nhd.usgs.gov/data.html

US Fish and Wildlife, Endangered and Threatened Species:
https://www.fws.gov/midwest/endangered/saving/outreach.html

Tornado Buffers: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Indiana State Department of Health County Profiles: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

Appendix A: Multi-Hazard Mitigation Planning Team Meeting Documentation

MEETING #1 MINUTES

WASHINGTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

October 25, 2018 – 1:00PM (local time)

Marianne Cardwell and Kayla Kauffam (The Polis Center) introduced themselves and welcomed the communities and agencies. Representatives from the following communities and agencies were present: Washington County EMA, Washington County EMS, Town of New Pekin, Town of Livonia, West Washington Schools, Salem Schools, East Washington Schools, and River Hills EDD & RPC.

Ms. Cardwell explained that the County's Multi-Hazard Mitigation Plan (MHMP) has expired and needs to be updated. Ms. Cardwell then discussed the meeting's agenda and shared background information on The Polis Center.

Ms. Cardwell defined Mitigation Planning and the Federal Disaster Mitigation Act of 2000. She noted that the Washington County MHMP was adopted in 2013 and expired in June of this year. Ms. Cardwell stated that the goal of this committee is to submit a new plan to FEMA by December 2018. Washington County needs this plan in order to access future funds from FEMA. All communities and agencies must participate to access funds as well.

Ms. Cardwell explained the Disaster Management Cycle. She followed by describing the plan update process in detail. Ms. Cardwell stated that the planning committee would use the prior plan as a starting point to understand the process that took place in the past 5 years. The team would review existing actions and policies and identify opportunities for improvements in reducing risks and future losses from hazards over the long term. Ms. Cardwell added that the team would also reassess hazards, vulnerabilities, and risks as needed.

Next, Ms. Cardwell discussed the roles and responsibilities of each participant and the importance of meeting the local match requirements. All team members must track time spent on the project. She then tasked each community and agency with completing the following items: 1) hazard rank worksheet, 2) mitigation strategies worksheet, and 3) community capability worksheet. Ms. Cardwell added that The Polis Center would begin updating the plan in the meantime.

The committee scheduled Meeting #2 for November 13, 2018 and Meeting #3 for December 5, 2018.

Ms. Cardwell thanked everyone for coming. The meeting was adjourned at 2:00 pm (local time).

Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

Hazard Mitigation Plan Update Meeting Number: Date:

NAME	TITLE/ROLE	COMMUNITY (County, Town, City)	EMAIL ADDRESS	Mileage	Time Spent on Surveys
Chelsea Crump	Charitable Financial Spec.	River Hills	ccrump@riverhills.cc		
Gary Nale	Town Mgr.	Nlg. Perkin	99h7166@YAHOO.com	18	2 hr
Hawley Jones	Clerk/Treasurer	Civil Town of Livonia	30 E Church ST Campbells Burg IN 47108	20	2 hrs
Robert Batchelor	Safety Coordinator	West Washington	robbatch@wwcs.k12.in.us	60	
Lynn Reed	Superintendent	Salem Schools	lreed@salemschools.com		
Greg Hopkins	Assist. to EW Supt	East Washington	ghopkins@ewsc.k12.in.us	12	
Trey Nicholson	EMS Director	Washington Co.	wcasmedic1501@yahoo.		
Desi Alexander	EMA/911 Director	Washington Co	desi.alexander@washington county.in.gov		

MEETING #2 MINUTES

WASHINGTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

November 13, 2018 – 5:00PM (local time)

Chelsea Crump, River Hills EDD & RPC, introduced herself and welcomed all of the communities and agencies in attendance. Representatives from the following communities and agencies were present: Washington County EMA, Indiana Department of Homeland Security, Washington County Health Department, Washington County Commissioners, City of Salem, St. Vincent Salem, Town of Campbellsburg, West Washington Schools, Salem Schools, East Washington Schools, and River Hills EDD & RPC.

Ms. Crump explained that the County's Multi-Hazard Mitigation Plan (MHMP) has expired and needs to be updated. She discussed the Community's role in the plan update, as well as the role of The Polis Center. Ms. Crump stated that Washington County will need this plan in order to access future funds from FEMA, and that all communities and agencies must participate to access funds as well.

Ms. Crump led a discussion with the participants that included reassessing hazards, vulnerabilities, and risks, and stating the probability in each community. The discussion was recorded by Ms. Crump and shared with the Polis Center to be included in the plan update.

Ms. Crump stated that Meeting #3 will take place on December 5, 2018 at 1:00 pm at the County Government Building in Salem. This meeting is open to the public and will be advertised in the local paper.

Desi Alexander, Washington County EMA, added that all team members should track time spent on the project in order for the County to meet local match requirements.

Ms. Crump thanked everyone for coming. The meeting was adjourned at 6:00 pm (local time).

Minutes Prepared by: Chelsea Crump, River Hills EDD & RPC

2018 Washington County LEPC Meeting Schedule - Sign In Sheet

Meeting Date: 11-13-18

#	Name	Category	Phone	Email	Contact Type	Signature
1	Alexander , Desiree	Emergency Management	812-583-4527 x	desi.alexander@washingtoncounty.in.gov	Primary	
2	Bierly , Joy	Local/State Government		joy.bierly@cityofsalem.com	Primary	Joy Bierly
3	Boling , Chris	Environmental		cboling@washingtoncounty.in.gov	Primary	
4	Day , Tom	Fire Departments	812-620-1188 x	firechief@cityofsalem.com	Primary	
5	Denise , Newkirk	Community Groups		dknewkirk@frontier.com	Primary	
6	Fleming , Venon	Hospitals		venon.fleming@medxcelfacilities.com	Primary	
7	Larrimore , Ryan	Law Enforcement		ryan.larrimore@washingtoncounty.in.gov	Primary	
8	Morrow , Lisa	Health		lisa.morrow@washingtoncounty.in.gov	Primary	
9	Nicholson , Troy	Emergency Medical Services		wcasmedic1501@washingtoncounty.in.gov	Primary	
10	Terkhorn , Wally	Local/State Government	[illegible]	wally.terkhorn@cityofsalem.com	Primary	Wally Terk
11	Walker , Mark	Industry		mark.walker@gkn.com	Primary	
12	White , Rebecca	Broadcast/Print Media	812-620-7271 x	wslmradio@gmail.com	Primary	
13	Williams , Chuck	Transportation		crwilliams2467@gmail.com	Primary	
14	Batcheler, Robert	School	812-620-4432	robbatch@wwcs.k12.in.us		Robert Batcheler
15	England, Terry	Home Health	812 404 6147	tengland627@yahoo		
16	Minnick, Jesse	IDHS /EM	317 605 6377	jminnick@dhs.in.gov		
17	Ph. Mp Marshall	Commissioner	812-620-1358	[illegible]		
18	Alicia Thompson	Health Dept	812 883 5603	ptnurse@washingtoncounty.in.gov		A. Thompson
19	Chelsa Crump	River Hills	812-725-3854	[illegible]		
20	Jean Dowen	Salem Schools	812-883-2103	jdowen@salemschools.com		Jean A Dowen

2018 Washington County LEPC Meeting Schedule - Sign In Sheet

Meeting Date: 11-13-18

#	Name	Category	Phone	Email	Contact Type	Signature
1	Lynn Reed	Salem Schools	812-883-4437	lreed@salemschools.com		Lynn Reed
2	Greg Hopkins	East Washington	812-967-3926	ghopkins@ewsck12.in.us		
3	Bonnie Thomas	Salem Schools	812-521-3330	bthomas@salemschools.com		
4	Jennifer Nicks	Salem Schools	812-896-2961	jnicks@salemschools.com		Jennifer Nicks
5	Pauline Hurst	Community Member	812-967-2194			Pauline Hurst
6	Melissa Sears	Salem Schools	812-595-1981	msears@salemschools.com		Melissa Sears
7	Chris Boling	Health Dept				
8	Jesse Baker	St. Vincent Salem	812-720-1044	jesse.baker.amedysce@sv.com		
9	Jennifer Martin	Salem Schools	812-883-3904	jmartin@salemschools.com		
10	Anita Collins	Town of Campbellsburg	812-755-4878	cburg@blueriver.net		
11	Micah Souder	Salem Schools	812-528-1073	msouder@salemschools.us		
12	Todd Alexander	Salem Schools	502-303-1717	talexander@salemschools.com		
13						
14						
15						
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20						

MEETING #3 MINUTES

WASHINGTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

December 5, 2018 – 1:00PM (local time)

Marianne Cardwell and Kayla Kauffman (The Polis Center) introduced themselves and welcomed the communities and agencies. Representatives from the following communities and agencies were present: Washington County EMA, Indiana Department of Homeland Security – D8, City of Salem, West Washington Schools, Salem Schools, East Washington Schools, and River Hills EDD & RPC.

Ms. Cardwell explained that the committee would be reviewing the draft plan today, which is made up of 6 main sections: Overview; Public Planning Process; Community Profile; Risk Assessment; Mitigation Goals and Strategies; and Plan Maintenance and Implementation. Ms. Cardwell stated that participants should feel free ask questions at any time.

Ms. Cardwell discussed *Chapter 2: Participating Jurisdictions*. She explained that all of the communities listed had been invited to participate, but that some elected not to.

Ms. Cardwell went over *Chapter 3: Community Profile, which* covers demographics of the county. Information in this chapter includes an overview of population, as well as comparisons to the State and other areas in the region.

Ms. Cardwell gave an overview of *Chapter 4: Risk Assessment,* which covers historic natural disasters and events in the county. Thunderstorms, flash floods, and floods ranked highest for the Washington County. This chapter also covers a list of hazard declarations in the County since 2010.

Ms. Cardwell led a discussion on *Chapter 5: Mitigation Goals and Strategies*. She explained that the Polis Center used data collected from participants regarding priority and rank of hazards, and combined them into a graph on page 34 of the document. Ms. Cardwell also stated that they created an analysis for top hazards to show how the County would be impacted. She encouraged the group to review the chapter to learn more.

Ms. Cardwell asked if there were any questions. There were none.

Ms. Cardwell went on to explain that the group would now review and update the Mitigation Actions (starting on page 118 of the plan) together. Participants discussed what was complete, what was still ongoing, the priority of each action, as well as funding options. Ms. Cardwell and Ms. Kauffman took note of all responses and explained that they would make the updates as soon as possible.

Ms. Cardwell explained that the Polis Center would finalize the draft document and send it to FEMA for approval by early next week. She asked that participants get any comments on the draft to her no later than Friday.

Ms. Cardwell asked if there were any questions. There were none.

Ms. Cardwell thanked everyone for coming. The meeting was adjourned at 3:00 pm (local time).

Appendix B: Public Notices in the Local Media

death, whichever is earlier, or the claims will be forever barred.

DATED at Salem, Indiana, this 2nd day of November, 2018.

Sarah Milligan, Clerk,
Washington Circuit Court
Daniel L. Brown, #23523-49
DANIEL L. BROWN LAW OFFICE, P.C.
#62 Public Square
P.O. Box 338
Salem, Indiana 47167
(812) 883-3200
Attorney for Co-Personal Representatives
L46c2 hspaxlp

L30ttf

Washington County Multi-Hazard Mitigation Plan Public Meeting Announcement

The Washington County Hazard Mitigation Steering Committee will host a public information and strategy planning session at 1:00PM on December 5, 2018 at the County Government Building, 806 S. Martinsburg Road, Salem, IN 47167.

Over the last several weeks, a planning committee consisting of community members has worked with The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to develop a Multi-Hazard Mitigation Plan for Washington County. Once the plan is completed, the committee will submit it to FEMA for approval. The committee will also work to develop funding for any mitigation activities that are identified.

The steering committee is interested in receiving public input on the plan. Anyone who has questions or would like to provide input should contact Desi Alexander, Washington County Emergency Management Agency Director, (812)883-4962.

LD47c1 hspaxlp

Appendix C: Historical Hazards from NCDC since 2010

Table 36. NCDC Events Since 2010

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
Washington County	December 26, 2012	Blizzard	0	0	0	0	0.00K	0.00K	According to Washington County's emergency manager, blizzard conditions developed for a few hours during the early morning of December 26th. A spotter in northwestern Washington County near Campbellsburg measured 5 inches of snow. A report of 7 inches of snow near Salem was relayed from the Washington County Department of Highways.
FARABEE	April 23, 2011	Flash Flood	0	0	0	0	0.00K	0.00K	Martinsburg Rd. was closed due to high water.
SALEM	May 2, 2011	Flash Flood	0	0	0	0	0.00K	0.00K	Rising water forced the closure of 3 roads in Salem. Water was also rising along State Hwy. 56 west of Livonia.
NEW PEKIN	May 2, 2011	Flash Flood	0	0	0	0	0.00K	0.00K	The Blue River was out of its banks and flooded roads and bridges.
SALEM	May 2, 2011	Flash Flood	0	0	0	0	0.00K	0.00K	Multiple roads were being closed in and around Salem due to quickly rising water.
MT CARMEL	June 26, 2011	Flash Flood	0	0	0	0	0.00K	0.00K	White River Road was closed due to flooding from a heavy thunderstorm.
BORDEN	June 26, 2013	Flash Flood	0	0	0	0	0.00K	0.00K	The Washington County emergency manager reported that numerous roads across the county were briefly closed by flash flooding. One major road closed was State Highway 150 in Hardinsburg. The convection behind this specific flooding was the third round of heavy storms of the day. A CoCoRahs spotter nearby in Fredricksburg, Indiana reported over 7 inches of rain for the day.
NEW PEKIN	April 4, 2014	Flash Flood	0	0	0	0	0.00K	0.00K	Several intersections in New Pekin were briefly impassable due to high water.
FREDDRICKSBURG	April 7, 2015	Flash Flood	0	0	0	0	0.00K	0.00K	State officials reported that US 150 had high water running over it. Between 1 and 2 inches of rain fell on top of very saturated ground.

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
NEW PEKIN	April 7, 2015	Flash Flood	0	0	0	0	0.00K	0.00K	State officials reported that an unusual amount of roads had high water running over them due to heavy rainfall, forcing them to be barricaded. Between 1 and 2 inches of rain fell on top of very saturated ground.
FREDDRICKSBURG	December 27, 2015	Flash Flood	0	0	0	0	0.00K	0.00K	Washington County law enforcement officials reported to the NWS that roads in and around Fredericksburg were closed to high water caused by heavy rainfall.
NEW PEKIN	December 27, 2015	Flash Flood	0	0	0	0	0.00K	0.00K	Washington County law enforcement officials reported to the NWS that roads in and around Pekin were closed due to high water from excessive rainfall.
SALEM	May 19, 2017	Flash Flood	0	0	0	0	40,000	0.0 K	An extremely warm, moist, and unstable air mass resided over the lower Ohio Valley during the middle of May. As a series of strong weather systems passed through the region, rounds of strong to severe thunderstorms developed and tracked across southern Indiana. Several inches of rain fell in a very short time resulting in a significant flash flood event for Washington County, Indiana. There were 2 confirmed tornadoes, one in Crawford County and another in Jefferson County, Indiana.
CANTON	May 19, 2017	Flash Flood	0	0	0	0	0	0.0 K	An extremely warm, moist, and unstable air mass resided over the lower Ohio Valley during the middle of May. As a series of strong weather systems passed through the region, rounds of strong to severe thunderstorms developed and tracked across southern Indiana. Several inches of rain fell in a very short time resulting in a significant flash flood event for Washington County, Indiana. There were 2 confirmed tornadoes, one in Crawford County and another in Jefferson County, Indiana.
FREDDRICKSBURG	May 3, 2010	Flood	0	0	0	0	5.00K	0.00K	The Blue River at Fredericksburg crested at 20.4 feet around 545 AM EST on May 3. Flood stage at Fredericksburg is 20 feet. At this level, water begins to enter some basements near the river.
FREDDRICKSBURG	May 2, 2011	Flood	0	0	0	0	0.00K	0.00K	The Blue River at Fredericksburg crested around 23.1 feet at 615 PM EST on May 2. Flood stage at Fredericksburg is 20 feet. Minor flooding occurs at this level, closing US Highway 150.

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
FREDDRICKSBURG	April 23, 2011	Flood	0	0	0	0	0.00K	0.00K	The Blue River at Fredericksburg crested around 22.5 feet at 515 AM EST on April 24. Flood stage at Fredericksburg is 20 feet. Minor flooding occurs at this level with some back road in the town flooded.
ROSEBUD	May 2, 2011	Flood	0	0	0	0	0.00K	0.00K	A spotter reported water over a road south of Mennonite School on Hardinsburg Rd.
FREDDRICKSBURG	December 5, 2011	Flood	0	0	0	0	0.00K	0.00K	The Blue River at Fredricksburg went into flood, cresting at 21.82 feet at 4 am December 5th. Flood stage is 20 feet.
FREDDRICKSBURG	June 27, 2013	Flood	0	0	0	0	0.00K	0.00K	Heavy rains on June 26th brought minor flooding to the Blue River at Fredricksburg during the early morning hours on the 27th. The river crested at 20.96 feet at around dawn, just over the established flood level of 20 feet.
FREDDRICKSBURG	December 22, 2013	Flood	0	0	0	0	0.00K	0.00K	Widespread heavy rains during the afternoon and evening hours on the 21st of December led to minor flooding of the Blue River at Fredricksburg. Flood stage is 20 feet, and the river crested at 12.4 feet around noon on the 22nd.
FREDDRICKSBURG	April 4, 2014	Flood	0	0	0	0	0.00K	0.00K	Widespread heavy rains of 3 to locally over 5 inches led to moderate flooding on the Blue River at Fredricksburg. The river exceeded its flood stage of 20 feet early on the 4th of April. It peaked at 23.77 feet late on the 4th before falling below flood stage early on the 5th.
FREDDRICKSBURG	December 27, 2015	Flood	0	0	0	0	0.00K	0.00K	Heavy rain events during the last week of December brought the Blue River at Fredericksburg into minor flood. The river rose reached a crest of 21.17 feet on December 28th.
FREDDRICKSBURG	April 29, 2017	Flood	0	0	0	0	0	0.00 K	An unseasonably warm and humid air mass developed across the lower Ohio Valley toward late April 2017. A powerful storm system across the central Plains brought several rounds of strong to severe thunderstorms to the region. Damaging winds and large hail occurred late on April 28 and into the morning hours April 29. Widespread rainfall of 3 to 6 inches fell across southern Indiana, resulting in flash flooding in some places.
FREDDRICKSBURG	February 25, 2018	Flood	0	0	0	0	0	0.00 K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.
FREDDRICKSBURG	February 25, 2018	Flood	0	0	0	0	0	0.00 K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.
Washington County	April 3, 2016	Frost/Freeze	0	0	0	0	0.00K	0.00K	Low temperatures ranged from 28 to 30 degrees across the county.
Washington County	April 5, 2016	Frost/Freeze	0	0	0	0	0.00K	0.00K	Low temperatures ranged from 28 to 32 degrees across the county.
Washington County	April 9, 2016	Frost/Freeze	0	0	0	0	0.00K	0.00K	Low temperatures across the area ranged from 30 to 32 degrees.
Washington County	April 10, 2016	Frost/Freeze	0	0	0	0	0.00K	0.00K	Low temperatures across the area ranged from 30 to 32 degrees.
FREDDRICKSBURG	April 28, 2012	Hail	0	0	0	0			
LITTLE YORK	May 4, 2012	Hail	0	0	0	0	0.00K	0.00K	
FREDDRICKSBURG	March 2, 2012	Hail	0	0	0	0		0.00K	
NEW PEKIN	March 2, 2012	Hail	0	0	0	0		0.00K	Baseball sized hail from the second of two supercells that affected New Pekin damaged many cars and buildings.
NEW PEKIN	March 2, 2012	Hail	0	0	0	0		0.00K	This hail came from the second of two supercells that traversed essentially the same path.

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
NEW PEKIN	March 2, 2012	Hail	0	0	0	0		0.00K	
MARTINSBURG	March 23, 2012	Hail	0	0	0	0	0.00K	0.00K	
SALEM	April 16, 2013	Hail	0	0	0	0		0.00K	A spotter reported 1.75 inch hail in Salem.
SOUTH BOSTON	April 16, 2013	Hail	0	0	0	0		0.00K	Local media reported 1 inch hail 6 miles east of Salem.
CAMPBELLSBURG	May 10, 2015	Hail	0	0	0	0	0.00K	0.00K	A broadcast meteorologist relayed to the NWS a public video of dime size hail.
HITCHCOCK STATION	June 23, 2016	Hail	0	0	0	0	0.00K	0.00K	The Washington County emergency manager reported pea to penny size hail near Bee Line and Hitchcock.
NEW PEKIN	June 23, 2016	Hail	0	0	0	0	0.00K	0.00K	
CAMPBELLSBURG	March 1, 2017	Hail	0	0	0	0	0	0.00 K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
MARTINSBURG	April 4, 2014	Heavy Rain	0	0	0	0	0.00K	0.00K	A spotter measured just over 4 inches of rain within a 40 hour period.
Washington County	February 6, 2010	Heavy Snow	0	0	0	0	0.00K	0.00K	A couple of observers measured 4 and 6 inches of snow respectively across eastern Washington County.
Washington County	February 15, 2010	Heavy Snow	0	0	0	0	0.00K	0.00K	A range of 7 to 10 inches of snow fell countywide.

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
Washington County	February 9, 2010	Heavy Snow	0	0	0	0	0.00K	0.00K	Five to 7 inches of snow fell countywide.
Washington County	January 20, 2011	Heavy Snow	0	0	0	0	0.00K	0.00K	Four and one half inches of snow was measured at New Salem.
Washington County	December 28, 2012	Heavy Snow	0	0	0	0	0.00K	0.00K	Observers measured 4 inches of snow in New Pekin and Salem.
Washington County	March 4, 2012	Heavy Snow	0	0	0	0	0.00K	0.00K	CoCoRaHS observers reported 3 to 4 inches of snow across Washington County.
Washington County	December 6, 2013	Heavy Snow	0	0	0	0	0.00K	0.00K	Spotters reported snowfall amounts varying from 4 to 6 inches of snow across Washington County.
Washington County	November 16, 2014	Heavy Snow	0	0	0	0	0.00K	0.00K	A couple of reports arrived via social media of 5.5 and 6 inches of snow that fell near Martinsburg and New Pekin respectively.
Washington County	March 4, 2015	Heavy Snow	0	0	0	0	0.00K	0.00K	Six inches of snow was measured in Fredricksburg. Southern portions of the county received up to 8 inches.
Washington County	February 16, 2015	Heavy Snow	0	0	0	0	0.00K	0.00K	Around 6 inches of snow fell across Washington County.
Washington County	April 2, 2016	High Wind	0	0	0	0	5.00K	0.00K	Estimated wind gusts between 55 and 60 mph across the region resulted in widespread power outages, downed trees and minor structural damage.
Washington County	December 15, 2010	Ice Storm	0	0	0	0	0.00K	0.00K	Between one quarter to one third of an inch of ice accumulated countywide. One to 2 inches of snow fell across the northern portion of the county.
HARRISTOWN	July 13, 2014	Lightning	0	0	0	0	100.00K	0.00K	Lightning struck a church just east of Salem, starting a fire. Damage was contained to just a portion of the building, but water and smoke damage was extensive.
HARDINSBURG	June 13, 2010	Thunderstorm Wind	0	0	0	0			A roof was blown off a barn on Hardinsburg-Livonia Rd.
MARTINSBURG	June 15, 2010	Thunderstorm Wind	0	0	0	0			A trained spotter reported estimated wind gusts of 60 mph.

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
ROSEBUD	February 28, 2011	Thunderstorm Wind	0	0	0	0	3.00K		Three modular homes sustained roof damage.
NEW PEKIN	April 19, 2011	Thunderstorm Wind	0	0	0	0			A trained spotter reported trees were blown down.
FREDDRICKSBURG	April 9, 2011	Thunderstorm Wind	0	0	0	0			A wet microburst occurred and a barn was destroyed. Winds were estimated to be 100 mph.
NEW PEKIN	April 9, 2011	Thunderstorm Wind	0	0	0	0			Trees were reported down.
CAMPBELLSBURG	May 23, 2011	Thunderstorm Wind	0	0	0	0			Trees and power lines were blown down in the Campbellsburg area.
PLATTSBURG	May 23, 2011	Thunderstorm Wind	0	0	0	0			A barn was destroyed by high winds.
FREDDRICKSBURG	June 19, 2011	Thunderstorm Wind	0	0	0	0		0.00K	The roof was blown off the Posey Township Fire House. Some bleachers and an announcer's booth were blown about 50 yards.
SALEM	July 19, 2012	Thunderstorm Wind	0	0	0	0		0.00K	Local law enforcement reported trees and power lines down near Salem.
CAMPBELLSBURG	July 27, 2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	The Washington County emergency management reported a few trees down near Campbellsburg.
CAMPBELLSBURG	July 8, 2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	The local emergency management reported that two trees were downed across the county. One fell in Campbellsburg. The other fell in Delaney Park in the western portion of the county.
SALEM	September 7, 2012	Thunderstorm Wind	0	0	0	0		0.00K	The Washington County Emergency Manager reported trees down in several locations, including the town of Salem.
SALEM	July 19, 2012	Thunderstorm Wind	0	0	0	0		0.00K	Local law enforcement reported several trees and power lines down near Highland Road in Salem.
NEW PEKIN	July 10, 2013	Thunderstorm Wind	0	0	0	0		0.00K	A spotter just south of New Pekin reported that three trees were uprooted.
HARRISTOWN	January 30, 2013	Thunderstorm Wind	0	0	0	0	50.00K	0.00K	A storm survey confirmed that straight line winds estimated at 75 mph damaged the roof of a double wide trailer along State

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									Highway 160 east of Salem. One barn was destroyed and another barn was damaged. This downburst covered an area roughly three tenths of a mile long and around 100 feet wide.
CANTON	November 17, 2013	Thunderstorm Wind	0	0	0	0	3.00K	0.00K	Local law enforcement reported that one telephone pole and a few trees were downed between Delaney Park and Little York.
NEW PEKIN	February 20, 2014	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local media relayed a report of an estimated 60 mph wind gust near New Pekin. Several trees were toppled in and around the town.
SALEM	May 22, 2014	Thunderstorm Wind	0	0	0	0	5.00K	0.00K	Local law enforcement reported that a tree fell onto a home in Salem.
BLUE RIVER	June 30, 2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A law enforcement official reported trees down across the area.
SALEM MUNI ARPT	December 23, 2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A broadcast meteorologist replayed a report of numerous trees down across Washington County, particularly along Highway 56 near the Salem Airport.
SALEM MUNI ARPT	December 23, 2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A public report was received via social media to the NWS of downed trees off Highway 60 near Salem.
HITCHCOCK STATION	June 14, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local law enforcement reported trees down.
CAMPBELLSBURG	June 15, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local broadcast media reported trees down in the area.
CAMPBELLSBURG	June 15, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	State officials reported trees down on powerlines on North Sycamore Street. This resulted in power outages.
MARTINSBURG	June 22, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter estimated winds around 50 knots.
NEW PEKIN	July 8, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local law enforcement reported trees down in the area due to severe thunderstorm winds.
SALEM	July 8, 2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local law enforcement reported trees down in the area due to severe thunderstorm winds.
RUSH CREEK VLY	March 1, 2017	Thunderstorm Wind	0	0	0	0	0	0.00 K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
PEKIN	March 1, 2017	Thunderstorm Wind	0	0	0	0	150,000	0.00 K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
MARTINSBURG	March 1, 2017	Thunderstorm Wind	0	0	0	0	25,000	0.00 K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
SALEM	July 7, 2017	Thunderstorm Wind	0	0	0	0	0	0.00 K	A powerful cold front pushed through the lower Ohio Valley during the evening hours on July 7. Ahead of this front, unseasonably warm and humid conditions prevailed with high temperatures in the lower 90s and dewpoints in the low to mid 70s. This provided plenty of instability. Several lines of thunderstorms developed across central Indiana and then

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									moved south into southern Indiana. Some large hail up to golf ball size in diameter was reported but the main impact was damaging wind gusts which brought down many trees and power lines, along with some structural damage as well. The storms were also noted for being prolific in-cloud and cloud-to-ground lightning producers.
KOSSUTH	July 7, 2017	Thunderstorm Wind	0	0	0	0	0	0.00 K	A powerful cold front pushed through the lower Ohio Valley during the evening hours on July 7. Ahead of this front, unseasonably warm and humid conditions prevailed with high temperatures in the lower 90s and dewpoints in the low to mid 70s. This provided plenty of instability. Several lines of thunderstorms developed across central Indiana and then moved south into southern Indiana. Some large hail up to golf ball size in diameter was reported but the main impact was damaging wind gusts which brought down many trees and power lines, along with some structural damage as well. The storms were also noted for being prolific in-cloud and cloud-to-ground lightning producers.
SALEM	November 5, 2017	Thunderstorm Wind	0	0	0	0	0	0.00 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3 tornadoes were confirmed in Washington County, in and around the town of Salem.
CANTON	November 5, 2017	Thunderstorm Wind	0	0	0	0	0	0.00 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3 tornadoes were confirmed in Washington County, in and around the town of Salem.
CANTON	November 5, 2017	Thunderstorm Wind	0	0	0	0	500	0.00 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									tornadoes were confirmed in Washington County, in and around the town of Salem.
LITTLE YORK	April 19, 2011	Tornado	0	0	0	0			An NWS storm survey confirmed an EF-0 tornado touched down in Washington county approximately 4 miles SSW of Little York. The tornado continued for 13 miles into Scott county where it finally lifted 5 miles north northeast of Austin. Maximum wind speeds were estimated to be 80 mph. Several trees were snapped or uprooted and a roof was damaged near North Rutherford Hollow Road. Mainly tree damage was observed along the rest of the path.
SMEDLEY	April 19, 2011	Tornado	0	0	0	0			An NWS storm survey confirmed an EF-1 tornado with wind speeds up to 100 mph. The tornado touched down at the intersection of West Batts Rd. and John Batt Road, where a grain bin was destroyed and several trees were blown over. Just southwest of the Mount Tabor Road/West Washington Road intersection the twister destroyed two silos and a 20ft x 30ft outbuilding. A single story house also suffered severe damage at that location. At the end of the damage path a house had its roof partially torn off and gravel from the driveway was lifted and pelted into the side of the house.
SMEDLEY	April 19, 2011	Tornado	0	0	0	0			An NWS storm survey confirmed an EF-0 tornado with winds up to 75 mph. This tornado traveled from the intersection of West Washington Road and Batt Road to just north of Mount Tabor Road. Along its path a silo and two barns were damaged. Several trees were knocked down or snapped.
CANTON	April 19, 2011	Tornado	0	0	0	0			An NWS storm survey confirmed an EF-0 tornado with wind speeds up to 80 mph. This tornado touched down along Jim Day Road about a quarter mile south of Lewellen Road where a 30ft x 40ft outbuilding was destroyed and its roof thrown about 75 yards to the north and east. The tornado ended just northeast of Lewellen Road where a house suffered roof damage, a 30ft x 50ft shed was destroyed, and a small grain bin was twisted and thrown 100 feet.
MT CARMEL	May 25, 2011	Tornado	0	0	0	0	0.00K	0.00K	This is the final stretch of the tornado that originated in Orange County, 3.1 miles northwest of Saltillo. After clipping the extreme southeast portion of Lawrence County, it entered

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									Washington County just south of East County Road 700 North and tracked northeastward for another 1.2 miles before dissipating at Spangler Hill Road. It caused EF-1 damage to numerous trees before lifting. The tornado's total path length was 3.2 miles.
MT CARMEL	May 25, 2011	Tornado	0	0	0	0	30.00K	0.00K	This tornado snapped and uprooted numerous trees along its 2.4 mile path. After touching down just east of the Lawrence/Washington County line south of W Saltillo Bono Rd, it downed several trees while moving over mainly open pasture land. Near the intersection of N Spangler Hill Rd and W Henry Brown Rd, it heavily damaged a metal outbuilding. From here it continued northeast, downing numerous trees and power lines as it roughly paralleled N Spangler Hill Rd through forested hills before dissipating near the intersection of N Spangler Hill Rd and N White River Rd.
DAISY HILL	March 2, 2012	Tornado	5	0	0	0	2.00M	0.00K	This EF-4 tornado that ultimately stayed on the ground for 49 miles across several counties touched down just south of Fredricksburg. Several trees were snapped off with estimated EF-1 damage along a path of 30 yards wide along the south fork of the Blue Lick River. After crossing farmland, the tornado widened and intensified quickly, toppling a high tension metal power structure near the intersection of Homers Chapel and Fredricksburg Roads. Damage at that location was consistent with 130 mph winds. ||High tension wires were downed and trees snapped along West End Road just north of Shanks Hill Road. The tornado continued to intensify as it crossed State Route 135 at Dutch Creek Road, ripping large chunks of 3 inch thick asphalt from a section of roadway and depositing large pieces up to 30 yards away, with smaller chunks of pavement found a quarter of a mile downstream. Just east of State Route 135, tremendous tree damage began. At this point, the tornado widened to around 200 yards. As the tornado crossed Trainer Lane and Route 335 towards Robbs Lane, widespread tree and structural damage indicated EF-2 to EF-3 damage. At this point, the damage path began to widen to one third of a mile. ||After crossing Highway 60 just south of New Pekin, tremendous structural damage was surveyed. A large well-constructed factory building was cleared to its

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									foundation slab with numerous anchoring bolts bent and stripped. Debris from this building was observed up to three quarters of a mile downstream. Large power poles were snapped. Another metal out building on the edge of the circulation had sheeting pulled off, apparently from the force of inbound winds towards the circulation. In this area 5 people were killed in a mobile home. Damage suggested an EF-4 tornado with a width of three to four tenths of a mile and estimated winds of 170 mph. ||The tornado then traveled along the border between Washington and Crawford counties where it caused widespread destruction southeast of Hurst and along East Daisy Hill Road in the county. Here, a well constructed one story brick home at the top of a ridge was completely destroyed with no wall left standing. Witnesses described the funnel as a black wall. A heavy semi trailer cab was blown from this house and landed near another destroyed brick home. Damage to these homes suggested EF-4 winds of 170 mph. Near the intersection of East Daisy Hill and Williams Knob Roads, a home and two anchored double wide trailers were destroyed. A car was lifted and fell 100 yards away from its original driveway. The width of the damage path along the county line was up to one half mile, although the concentrated damage path was much more narrow. Overall, the twister traveled 17 miles in Washington county, felling thousands of trees in addition to destroying scores of buildings.
RUSH CREEK VLY	March 1, 2017	Tornado	0	0	0	0	150,000	0.0 K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
ROSEBUD	November 5, 2017	Tornado	0	0	0	0	100,000	0.0 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3 tornadoes were confirmed in Washington County, in and around the town of Salem.
SALEM	November 5, 2017	Tornado	0	0	0	0	250,000	0.0 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3 tornadoes were confirmed in Washington County, in and around the town of Salem.
CANTON	November 5, 2017	Tornado	0	0	0	0	200,000	0.0 K	Unseasonably warm and humid air collided with a strong cold front during the evening hours on November 5. An outbreak of severe weather, including multiple tornadoes, took place across the lower Ohio Valley from portions of Illinois, Indiana, and Ohio. As the line of storms moved into southern Indiana, 3 tornadoes were confirmed in Washington County, in and around the town of Salem.
Washington County	January 7, 2010	Winter Storm	0	0	0	0	0.00K	0.00K	Three to 4 inches of snow fell countywide.
Washington County	February 4, 2014	Winter Storm	0	0	0	0	0.00K	0.00K	A trained spotter reported 4 to 5 inches of snow across the county. Heavy snow fell for around 3 hours, followed by one quarter of an inch of ice. Several trees were downed due to icing.
Washington County	March 2, 2014	Winter Storm	0	0	0	0	0.00K	0.00K	A spotter in Salem reported that one quarter inch of ice covered surfaces by early afternoon. Later that evening, sleet accumulated up to one half inch before ending as light snow with an additional accumulation of 1 to 2 inches.
Washington County	January 12, 2018	Winter Storm	0	0	0	0	0	0.00 K	A sharp cold front and a deep low pressure system brought widespread precipitation to southern Indiana January 12. As temperatures dropped from the 40s and 50s into the 30s and 20s, rain changed over to freezing rain, sleet, and snow. Snow amounts ranged from 1 to 5 inches, which fell on top a glaze to

Location	Date	Event	Dir. Death	Dir. Injuries	Indir. Injuries	Indir. Death	Prop. Cost	Crop Cost	Description
									1/4 inch of ice. Travel was severely impacted with widespread school and business closures.

Appendix D: Essential & Critical Facilities List and Maps

Essential Facilities

Table 37. Medical Care Facilities

Facility Name	Address	City
Newlon'S Grocery	11 W Sthy 60	Pekin
Mission In Home Health Care, Llc	190 Becks Mill Rd	Salem
Mission In Home Services And Associates	190 Becks Mill Rd	Salem
Blue River Services Inc	75 E Oak Dr	Salem
Ruler Discount Foods 205	805 S Main St	Salem
Jay C 86	601 S Main St	Salem
Cvs 6722	103 E Hackberry St	Salem
Save-A-Lot 906	1110 W Mulberry St	Salem
Blue River Services Inc	118 Nichols Ave	Salem
St Vincent Salem Hospital	911 N Shelby St	Salem
Meadow View Health And Rehabilitation Ce	900 Anson St	Salem
Washington County Wic Program	504 Reid Ave	Salem
Fresenius Medical Care Salem	102 Connie Ave	Salem
Salem Crossing	200 Connie Ave	Salem
Salem Dialysis Center	1201 N Jim Day Rd	Salem

Table 38. School Facilities

Facility Name	Address	City
Elk Creek Parochial School	1824 N Leval Ratts Rd	Salem
East Salem Parochial School	2412 N Naugle Rd	Salem
Twin Oaks Amish School	6457 S W Washington Schl Rd	Salem
Eastern High School	1050 N Eastern School Rd E-3	Pekin
East Washington Middle School	1100 N Eastern School Rd E-5	Pekin
West Washington Jr-Sr HS	8028 W Batt Rd	Campbellsburg
West Washington Elem School	8030 W Batt Rd	Campbellsburg
Salem High School	700 N Harrison St	Salem
Bradie M Shrum Upper Elem	1101 N Shelby St	Salem
Salem Middle School	1001 N Harrison St	Salem
Bradie M Shrum Lower Elem	1103 N Shelby St	Salem
East Washington Elem School	1020 N Eastern School Rd	Pekin
Southern Hill Mennonite School	4124 Hardinsburg Livonia Rd	Campbellsburg

Table 39. Police Stations

Facility Name	Address	City
Washington County Sheriff	801 Jackson St	Salem
Salem Police Dept	38 Public Sq	Salem

Table 40. Fire Stations

Facility Name	Address	City
Campbellsburg Volunteer Fire Department	21 W Oak St	Campbellsburg
Monroe Twp Volunteer Fire Department	8382 N Lick Skillett Road	Vallonia
Salem Fire Dept	38 Public Sq	Salem
Blue River Fire Dept	4534 S Becks Mill Rd	Salem
Posey Twp Volunteer Fire Department	10550 S. Radcliffe Road	Hardinsburg
Jackson Twp Volunteer Fire Department	4330 Martinsburg Fire Rd	Palmyra
Gibson Twp Little York Fire Department	489 N State Road 39	Little York
Livonia Volunteer Fire and Rescue	130 W. Church St	Livonia
Pierce-Polk Twp Volunteer Fire Dept	132 S Third St	Pekin
Northwest Washington Fire Co	5110 W Walnut Ridge Rd	Salem

Table 41. Emergency Operations Center

Facility Name	Address	City
Washington County EMA	801 Jackson St	Salem

Critical Facilities

Table 42. Airport Facilities

Facility Name	Use	City
Hardin	Private	Salem
Lowells Landing	Private	Hardinsburg
Morgan Airfield	Private	Salem
Salem Muni	Public	Salem
Spring Lake	Private	Pekin
Washington County Hospital	Private	Salem

Table 43. Communication Facilities

Facility Name	Use	City
W233AO	FX	Salem
WHAN-LP	CA	Salem
WSLM	AM	Salem
WSLM	AM	Salem
WSLM-FM	FA	Salem
WSLM-FM	FM	Salem
WZKF	FA	Salem

Table 44. Hazmat Facilities

Facility Name	Chemical Name	Address	City
Child Craft Inds. Inc.	Xylene (Mixed Isomer	501 E. Market St.	Salem
Child Craft Inds. Inc.	Ethylbenzene	501 E. Market St.	Salem

Child Craft Inds. Inc.	"1,2,4-Trimethylbenz	501 E. Market St.	Salem
Child Craft Inds. Inc.	Methyl Isobutyl Keto	501 E. Market St.	Salem
Gkn Sinter Metals	Manganese Compounds	Becks Mill Rd.	Salem
Gkn Sinter Metals	Nickel	Becks Mill Rd.	Salem
Gkn Sinter Metals	Copper	Becks Mill Rd.	Salem
Helsel Inc.	Nickel	596 W. Oak St.	Campbellsburg
Helsel Inc.	Chromium	596 W. Oak St.	Campbellsburg
Helsel Inc.	Copper	596 W. Oak St.	Campbellsburg
Helsel Inc.	Zinc Compounds	596 W. Oak St.	Campbellsburg
Kimball Office Casegoods Mfg. - Salem	Certain Glycol Ether	Hwy. 56 E.	Salem
Kimball Office Casegoods Mfg. - Salem	N-Butyl Alcohol	Hwy. 56 E.	Salem
Tecumseh Prods. Co. - Salem Ops.	Manganese	1555 S. Jackson St.	Salem
Tecumseh Prods. Co. - Salem Ops.	Copper	1555 S. Jackson St.	Salem
Tecumseh Prods. Co. - Salem Ops.	Methanol	1555 S. Jackson St.	Salem

Table 45. Potable Water

Facility Name	Address	City
Lake John Hay Water Plant	3978 N. Rinkers Road	Salem

Table 46. Waste Water Treatment Plants

Facility Name	Address	City
Campbellsburg Municipal WWTP	Sycamore & W Oak St	Campbellsburg
New Pekin Municipal WWTP	Charles Rd N & S Park Rd	New Pekin
Salem WWTP	SR 135 & W Joseph St	Salem

Appendix E: Hazard Maps

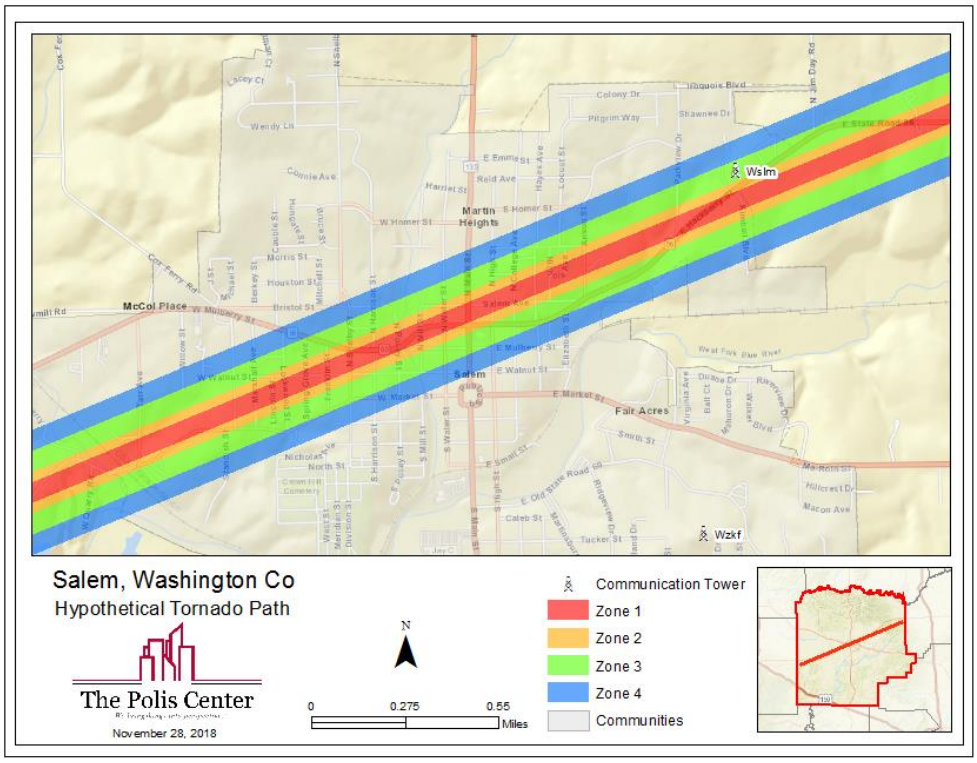

Figure 53. Damaged Critical Facilities

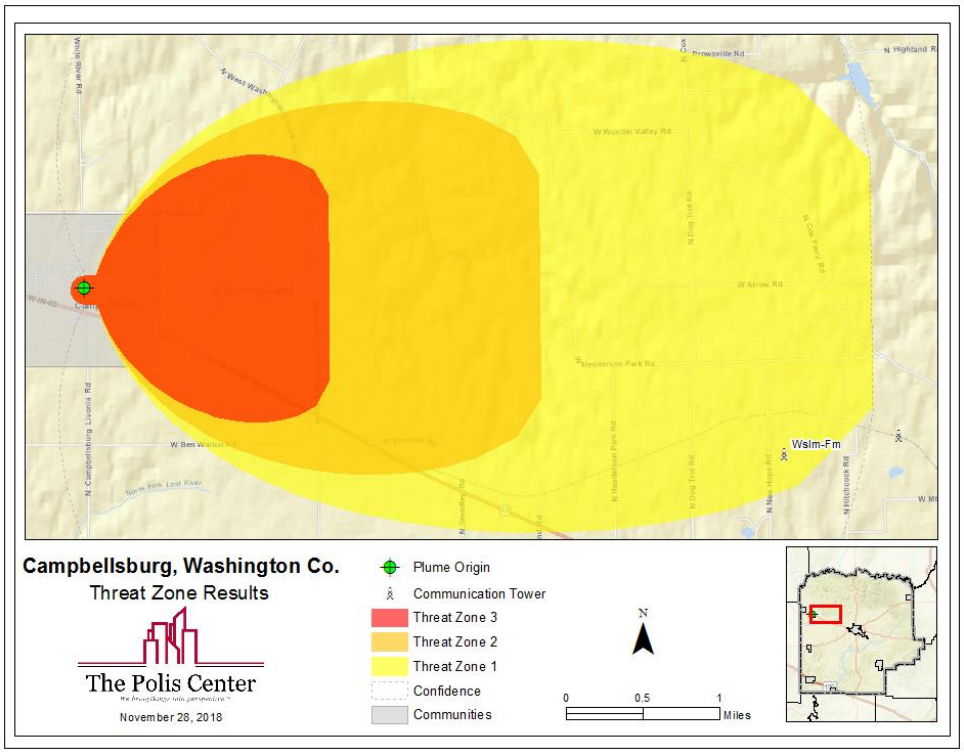

Figure 54. Hazmat: Damaged Critical Facilities

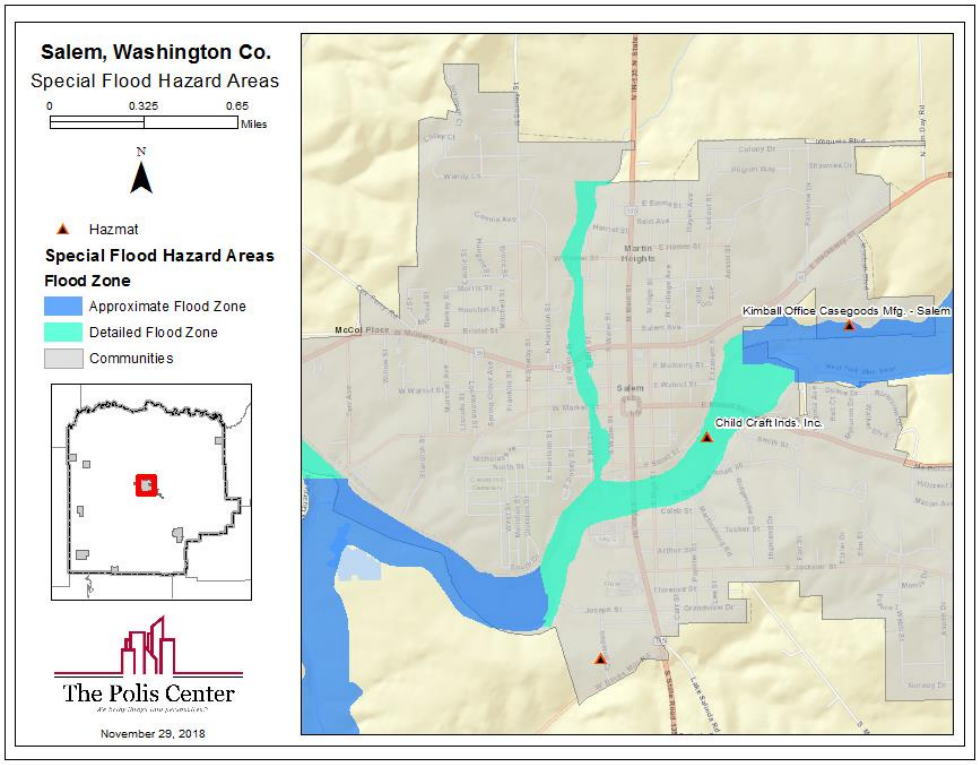

Figure 55. Flood: Damaged Critical Facilities, Salem

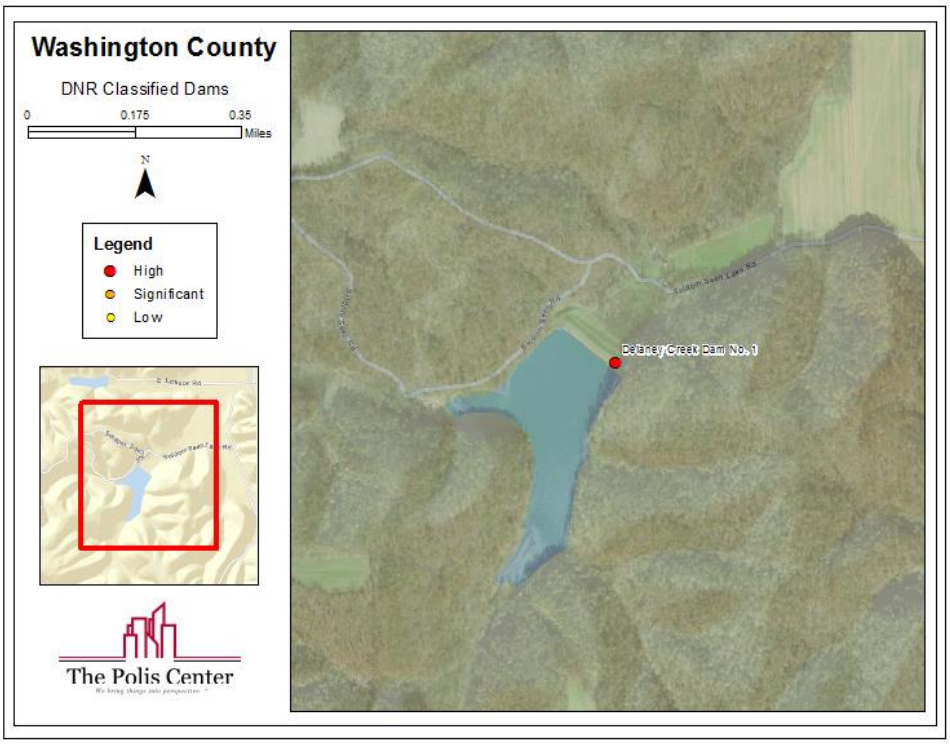

Figure 56. DNR Classified Dams, Delaney Creek Dam No. 1

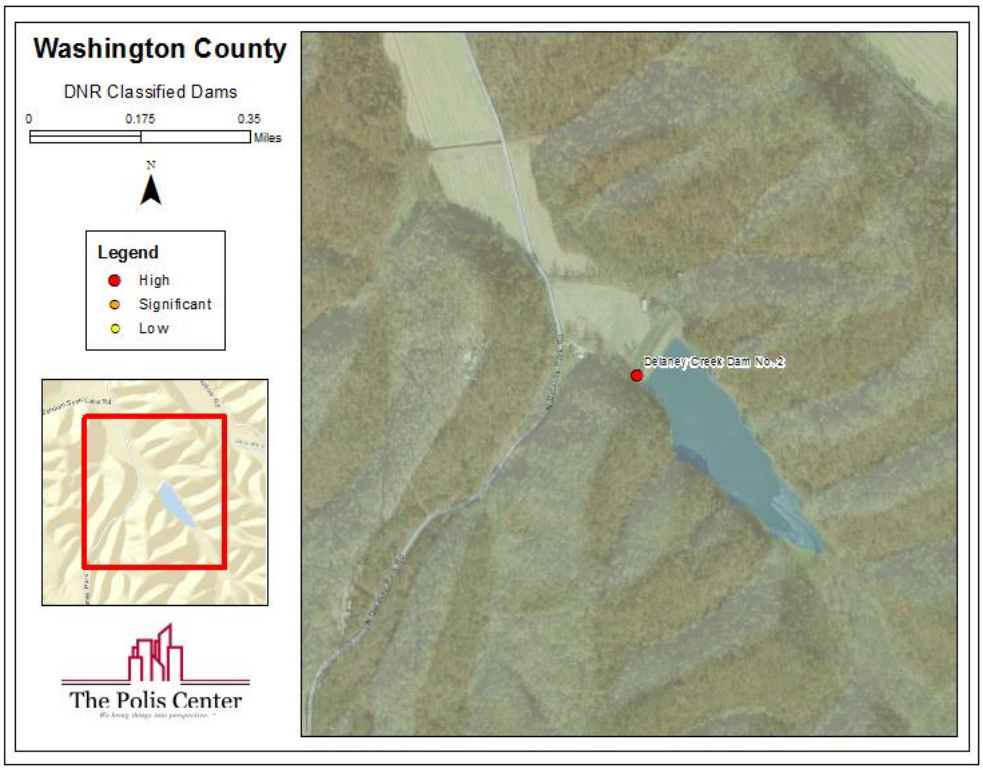

Figure 57. DNR Classified Dams, Delaney Creek Dam No. 2

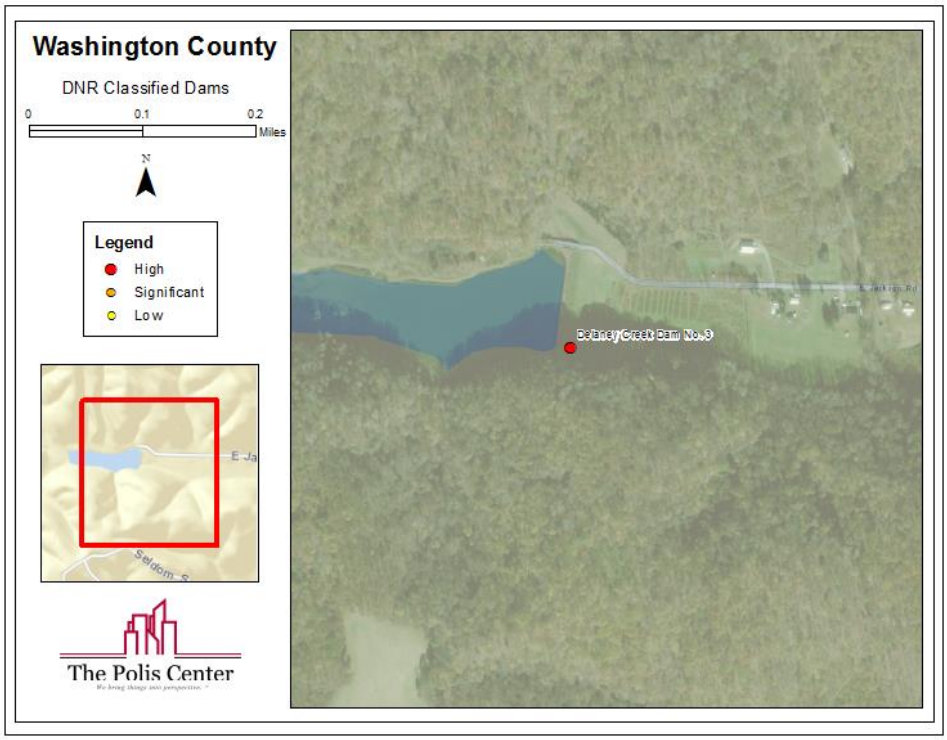

Figure 58. DNR Classified Dams, Delaney Creek Dam No. 3

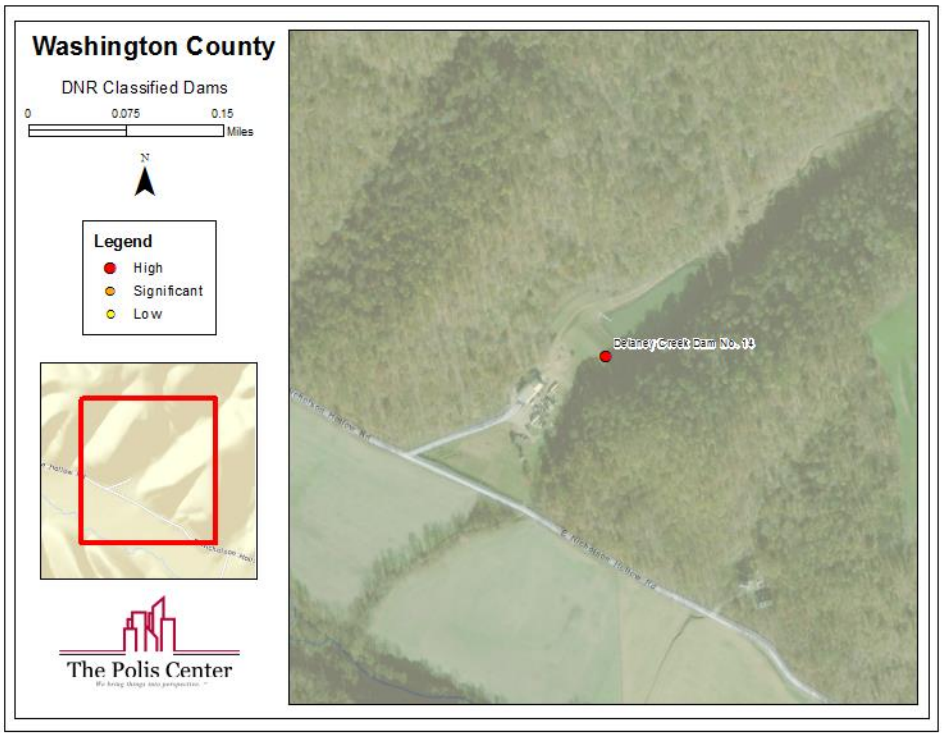

Figure 59. DNR Classified Dams, Delaney Creek Dam No. 14

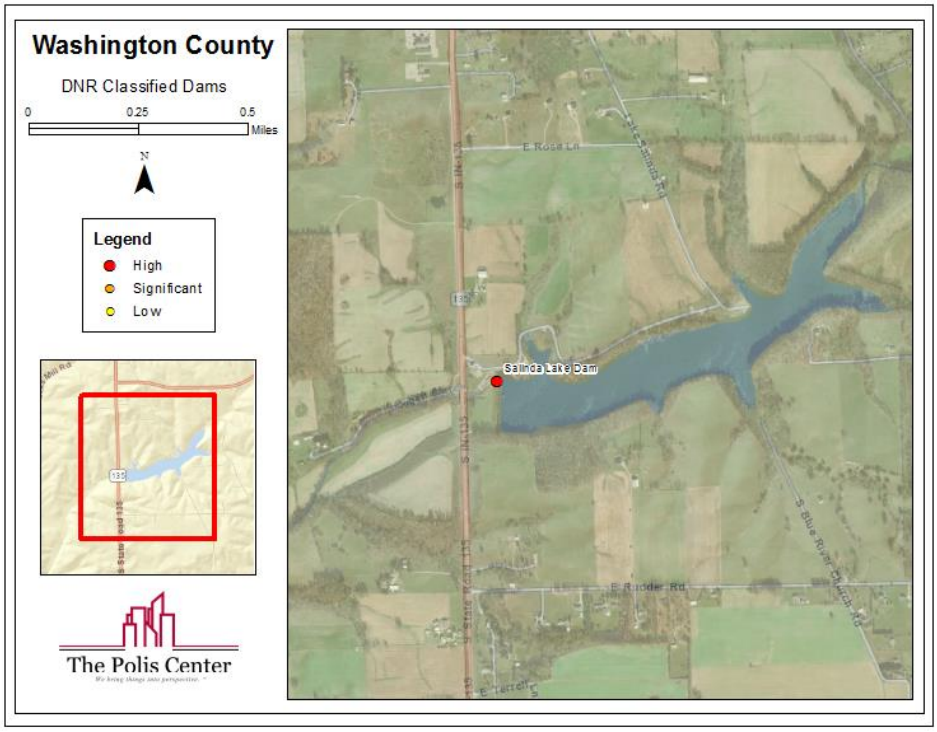

Figure 60. DNR Classified Dams, Salinda Lake Dam

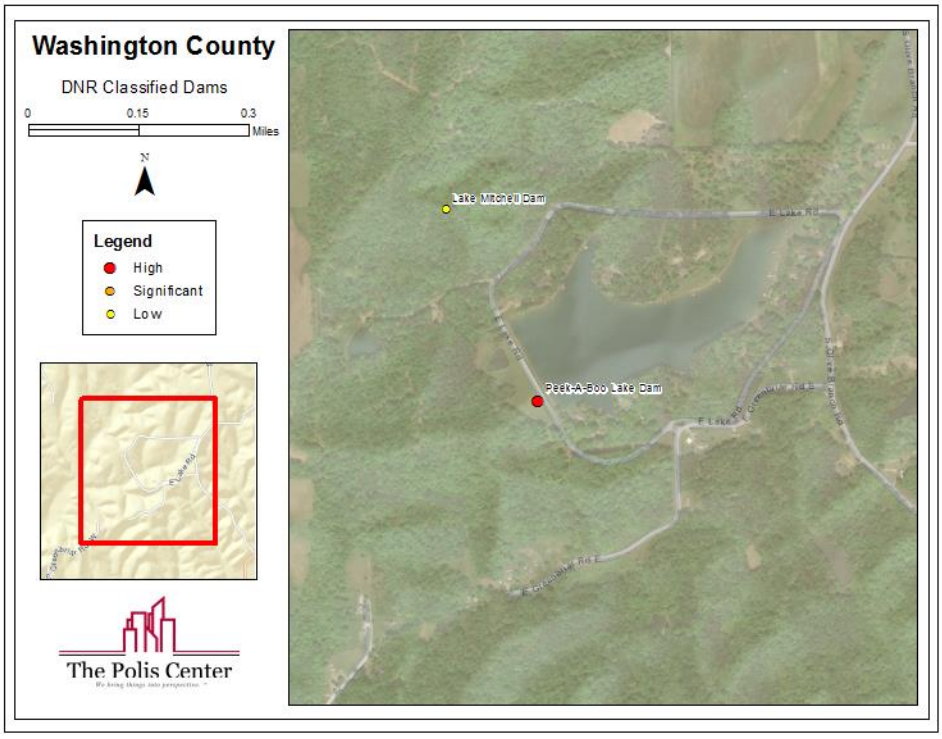

Figure 61. DNR Classified Dams, Peek-A-Boo Lake Dam

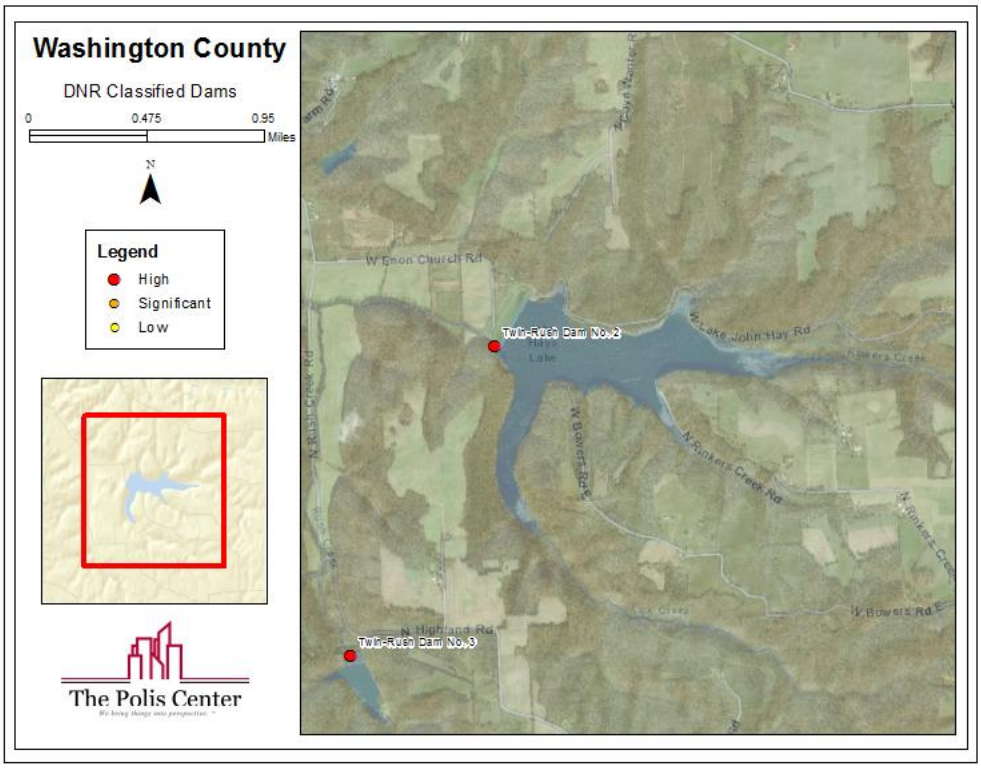

Figure 62. DNR Classified Dams, Twin-Rush Dam No. 2

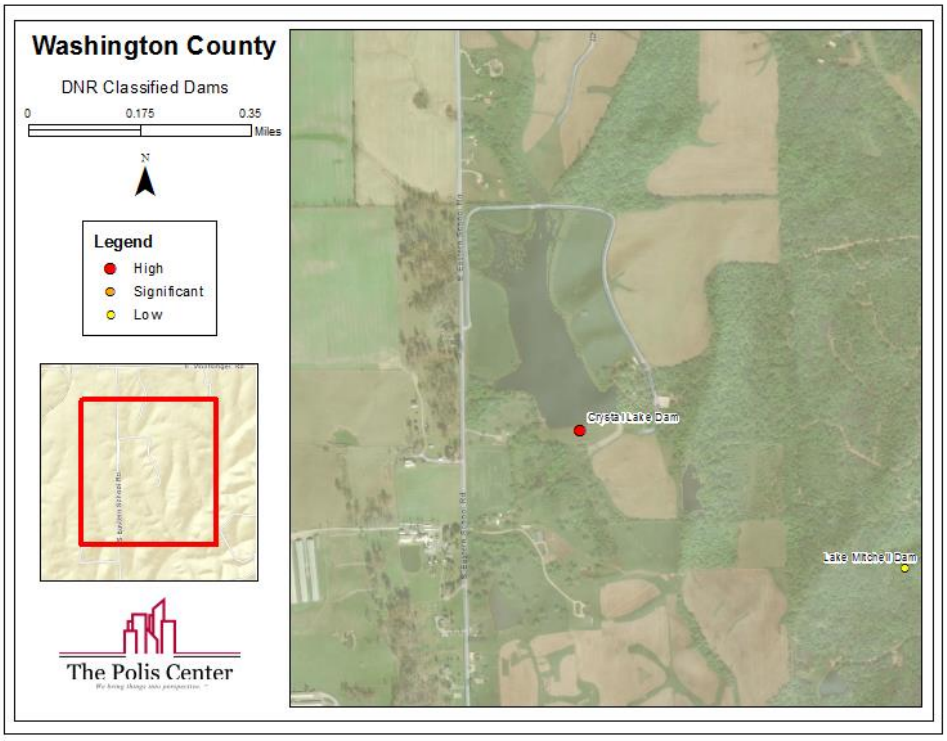

Figure 63. DNR Classified Dams, Crystal Lake Dam

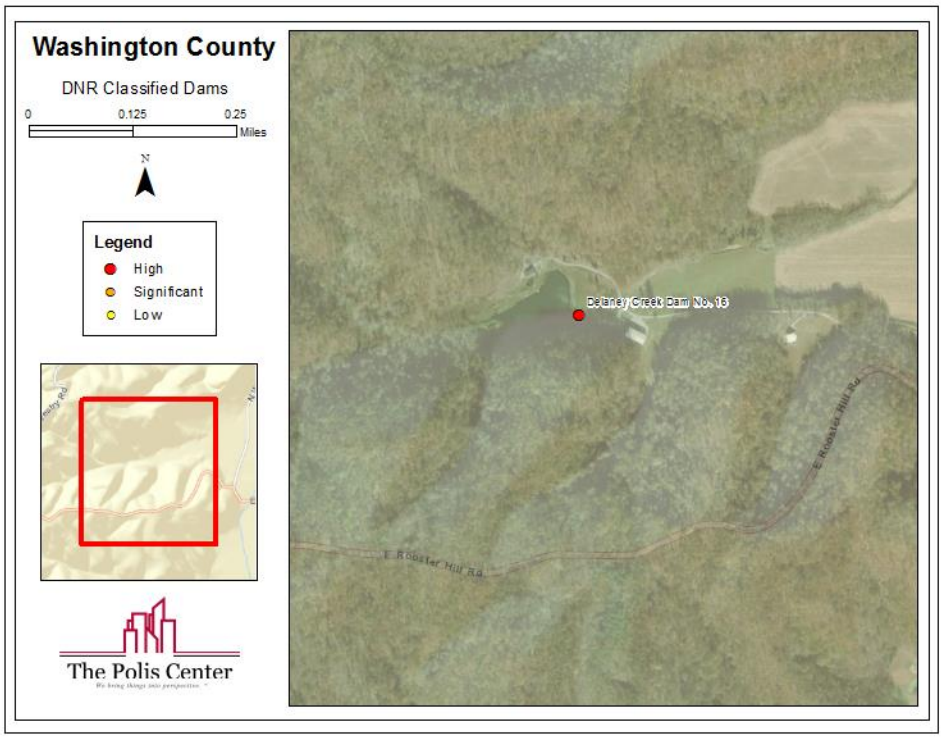

Figure 64. DNR Classified Dams, Delaney Creek Dam No. 16

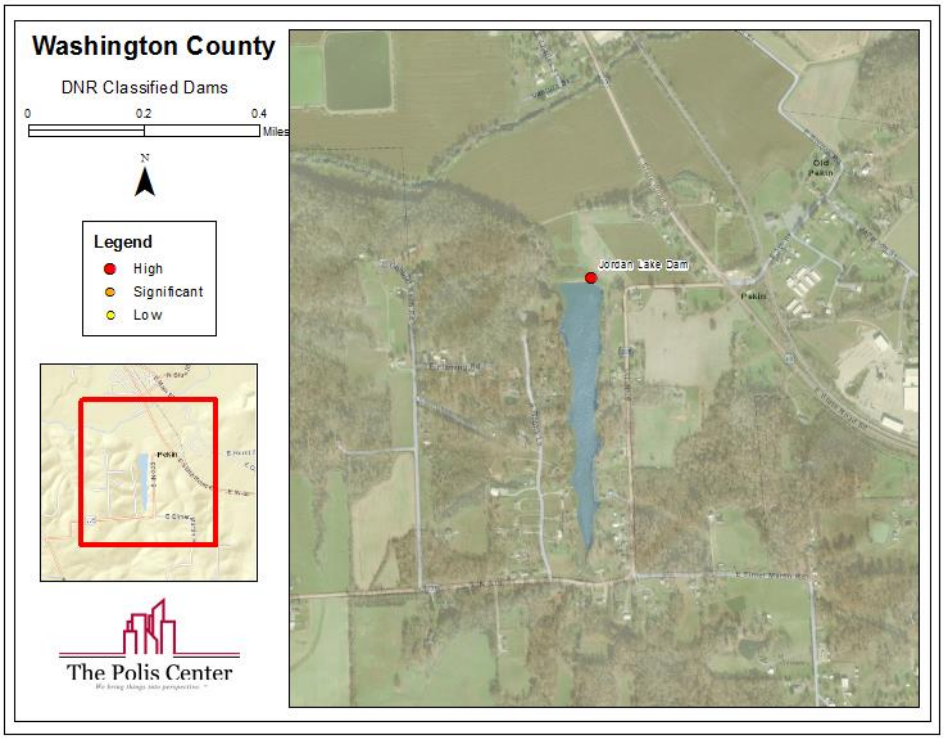

Figure 65. DNR Classified Dams, Jordan Lake Dam

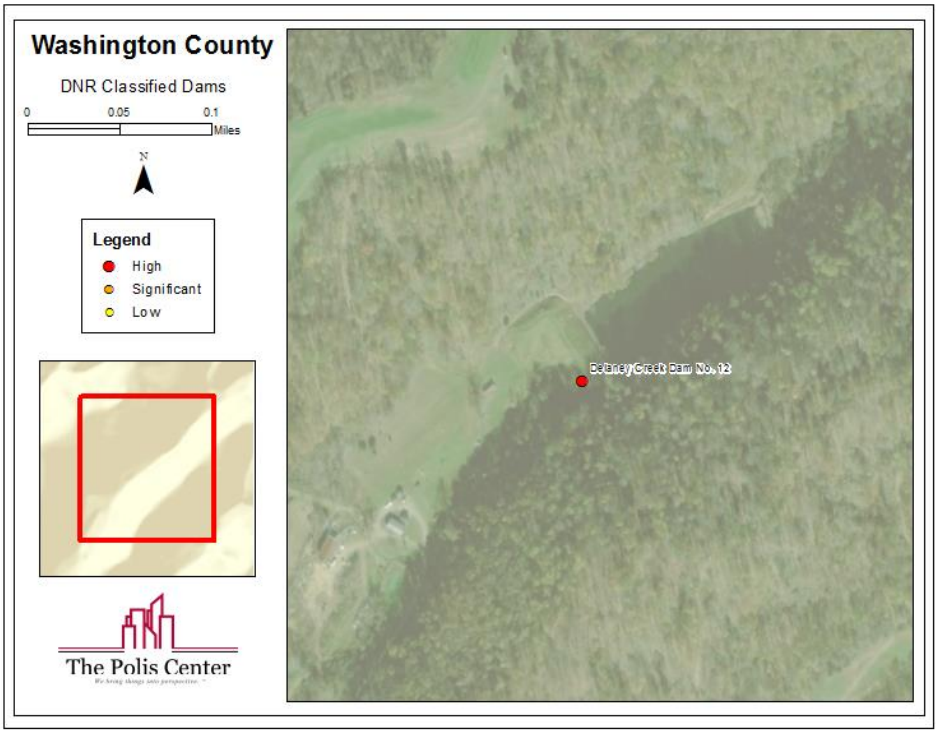

Figure 66. DNR Classified Dams, Delaney Creek Dam No. 12

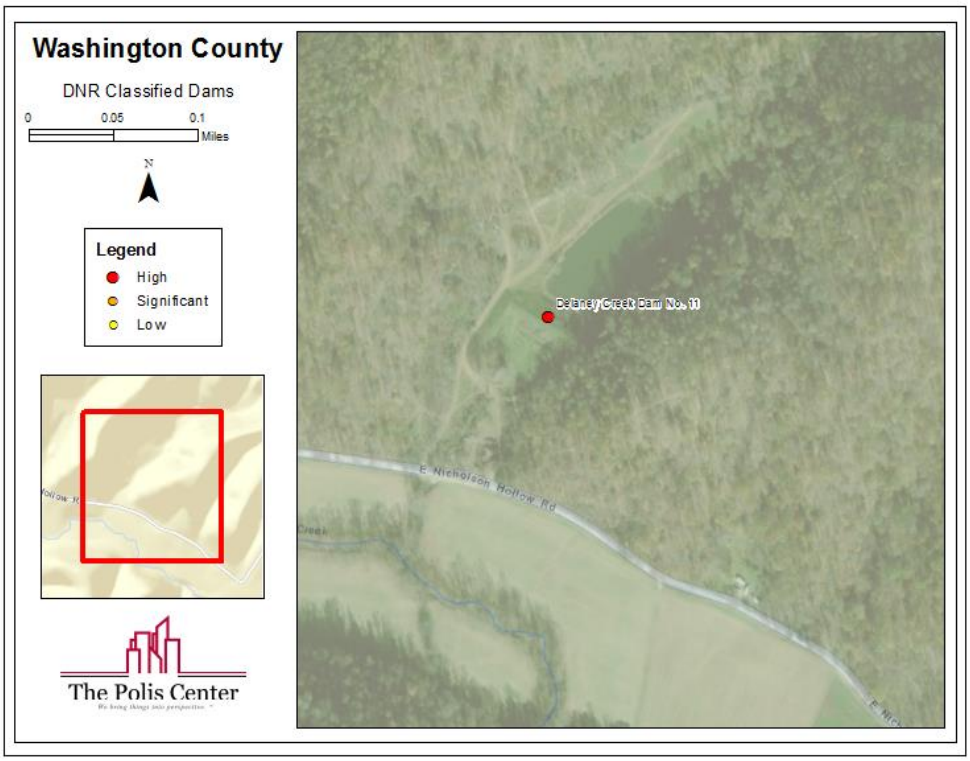

Figure 67. Classified Dams, Delaney Creek Dam No. 11

Appendix F: Community Capability Assessment Results

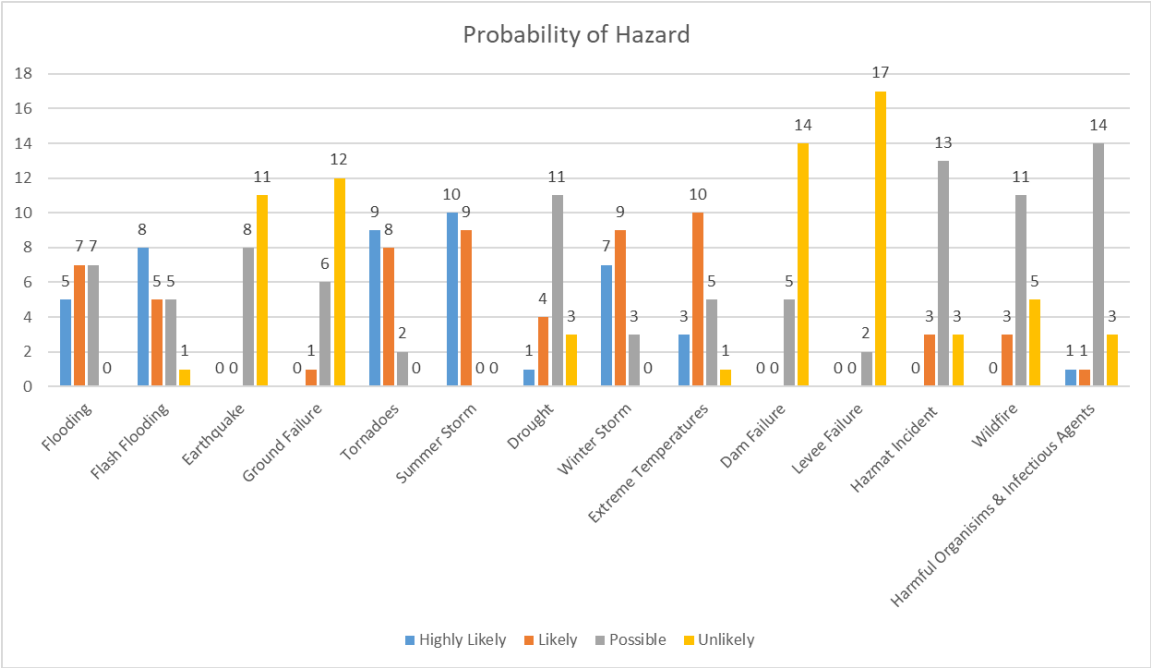

Figure 68. Hazard Priority Survey Results. Total of 19 Reponses

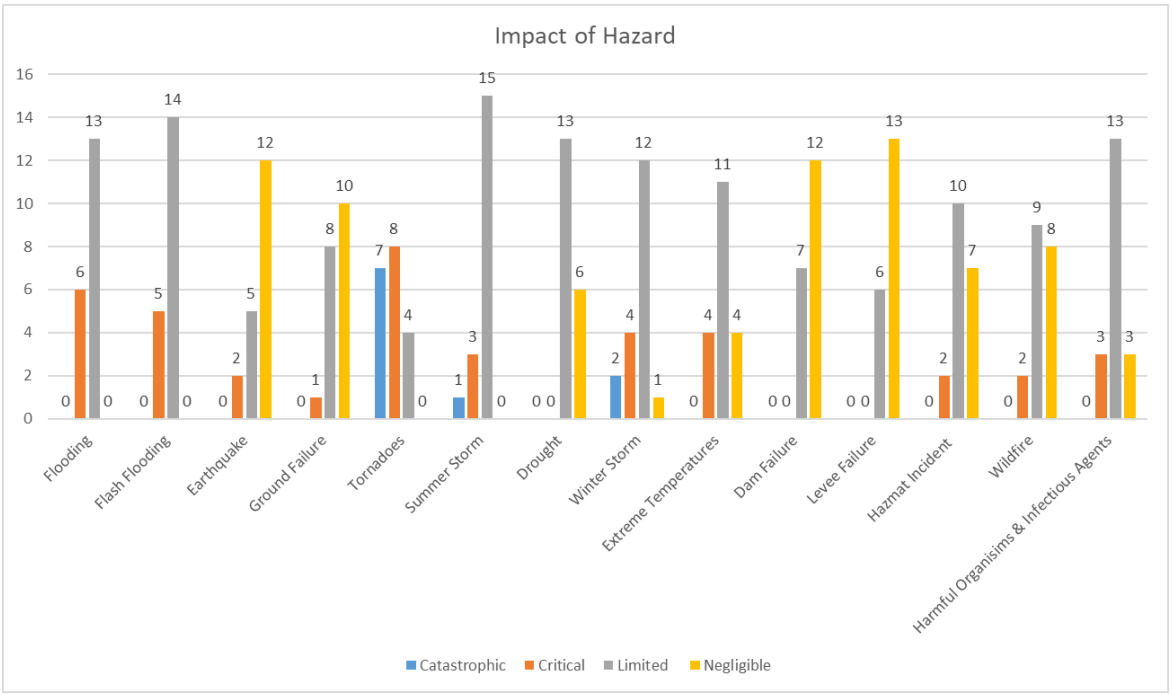

Figure 69. Hazard Priority Rank Survey. Total of 19 Responses

Appendix G: Adopting Resolutions

RESOLUTION OF THE CITY OF _____

ADOPTION OF THE WASHINGTON COUNTY
MULTI-HAZARD MITIGATION PLAN

WHEREAS the City of _____ has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Act establishes a framework for the development of a multi-jurisdictional County Hazard Mitigation Plan; and

WHEREAS, the Act as part of the planning process requires public involvement and local coordination among neighboring local units of government and businesses; and

WHEREAS, the Washington County Plan includes a risk assessment including past hazards, hazards that threaten the county, an estimate of structures at risk, a general description of land uses and development trends; and

WHEREAS, the Washington County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Washington County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Washington County will maintain public participation and coordination; and

WHEREAS, the Plan has been shared with the Indiana Department of Homeland Security and the Federal Emergency Management Agency for review and comment; and

WHEREAS, the Washington County Multi-Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, Washington County Multi-Hazard Mitigation Plan updates the existing Multi-Hazard Mitigation Plan adopted in _____ (month/year); and

WHEREAS, this is a multi-jurisdictional plan and cities and towns that participated in the planning process may choose to also adopt the county plan.

NOW THEREFORE, BE IT RESOLVED BY WASHINGTON COUNTY, INDIANA, that the City of _____ supports the hazard mitigation planning efforts and wishes to adopt the Washington County Multi-Hazard Mitigation Plan.

This resolution was declared duly passed and adopted and was signed by the _____ and attested by the _____ this _____ day of _____, 201_.

_____

Attest:

_____

Appendix F: Community Capabilities

Capabilities	Washington County	Salem	Campbellsburg	Livonia	New Pekin
Comprehensive Plan	2010	2010	2007	-	2012
Emergency Operations Plan	2018	2018	2018	2018	2018
Watershed Plan	-	-	-	-	-
Resilience Report					
Zoning Ordinance	2016	2015	-	-	-
Building Codes/ Ordinance	1985	2005		-	-
Floodplain Ordinance	2013	2017	-	-	-
Storm Water Ordinance	-	2018	2018	-	2012
Erosion Ordinance	State Erosion Control Rule 5 (327 IAC 15-5)	1990	State Erosion Control Rule 5 (327 IAC 15-5)		
Burning Ordinance	State	State	State	State	State

Capabilities	Washington County	Salem	Campbellsburg	Livonia	New Pekin
Capital Improvements Project Funding	-	Yes	-	-	-
Authority to Levey Taxes for Specific Purposes	-	-	-	-	Yes
Fees for water, sewer, gas or electric services	-	-	-	-	Yes
Impact fees for new development	-	-	-	-	-
Storm Water Utility Fee	-	-	-	-	-
Incur Debt through general obligation bonds and/or special tax bonds	-	-	-	-	Yes
Community Development Block Grant	-	-	-	-	-

	Washington County	Salem	Campbellsburg	Livonia	New Pekin
Chief Building Officer	Yes	Yes	Yes	-	-
Floodplain Administrator	Yes	Yes	-	-	-
Emergency Manager	Yes	Yes (county)		-	-
Community Planner	Yes	Yes	Yes	-	-
Civil Engineer	-	-	-	-	-
GIS Coordinator	Yes	Yes (County)		-	-
	Washington County	**Salem**	**Campbellsburg**	**Livonia**	**New Pekin**
Planning Commission	Yes	Yes	Yes	-	-
Mitigation Planning Committee	Yes	Yes	Yes	-	-
Maintenance Programs to Reduce Risk	Yes	Yes	Yes	-	-
Mutual Aid Agreements	-	Yes	-	-	-
Warning Systems/Services (Ie. Reverse 911, Outdoor Warning Signals)	Yes	Yes	Yes	-	Yes
Hazard Data & Information	-	-	Yes	-	-
Grant Writing	-	-	-	-	Yes